NASA SP-7011(279)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 279)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in December 1985 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA).*

NASA Scientific and Technical Information Branch 1986
National Aeronautics and Space Administration
Washington, DC

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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* lists 175 reports, articles and other documents announced during December 1985 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA).* The first issue of the bibliography was published in July 1964.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects of biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by *STAR* categories 51 through 55, the Life Sciences division. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. The *IAA* items will precede the *STAR* items within each category.

Seven indexes -- subject, personal author, corporate source, foreign technology, contract, report number, and accession number -- are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1985 Supplements.

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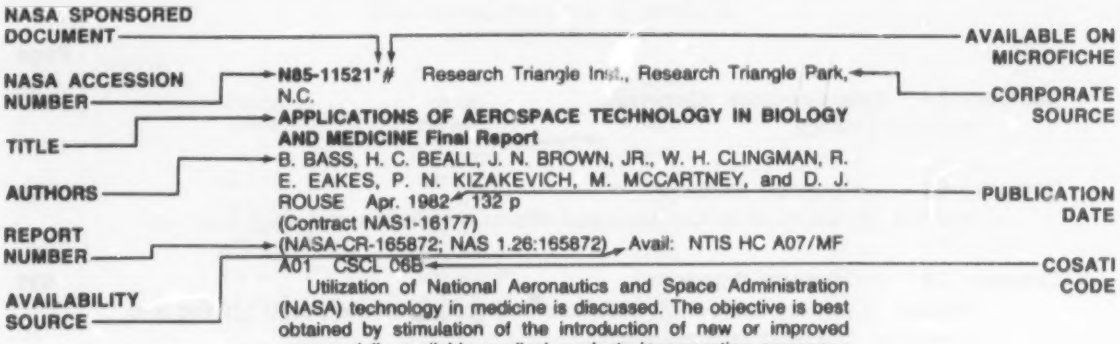


N85-11521*# Research Triangle Inst., Research Triangle Park, N.C.

APPLICATIONS OF AERCSPACE TECHNOLOGY IN BIOLOGY AND MEDICINE Final Report

B. BASS, H. C. BEALL, J. N. BROWN, JR., W. H. CLINGMAN, R. E. EAKES, P. N. KIZAKEVICH, M. MCCARTNEY, and D. J. ROUSE Apr. 1982 132 p

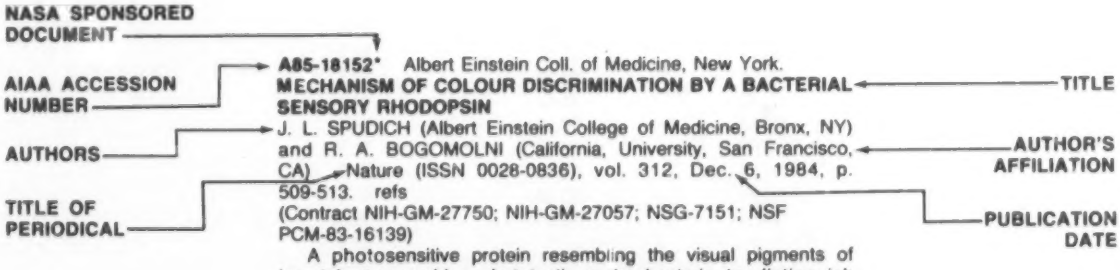
(Contract NAS1-16177)

(NASA-CR-165872; NAS 1.26:165872) Avail: NTIS HC A07/MF A01 CSCL 06B

Utilization of National Aeronautics and Space Administration (NASA) technology in medicine is discussed. The objective is best obtained by stimulation of the introduction of new or improved commercially available medical products incorporating aerospace technology. A bipolar donor/recipient model of medical technology transfer is presented to provide a basis for the team's methodology. That methodology is designed to: (1) identify medical problems and NASA technology that, in combination, constitute opportunities for successful medical products; (2) obtain the early participation of industry in the transfer process; and (3) obtain acceptance by the medical community of new medical products based on NASA technology. Two commercial transfers were completed: the Stowaway, a lightweight wheelchair that provides mobility for the disabled and elderly in the cabin of commercial aircraft, and Micromed, a portable medication infusion pump for the reliable, continuous infusion of medications such as heparin or insulin. The marketing and manufacturing factors critical to the commercialization of the lightweight walker incorporating composite materials were studied. Progress was made in the development and commercialization of each of the 18 currently active projects.

E.A.K.

TYPICAL CITATION AND ABSTRACT FROM *IAA*



A85-18152* Albert Einstein Coll. of Medicine, New York.

MECHANISM OF COLOUR DISCRIMINATION BY A BACTERIAL SENSORY RHODOPSIN

J. L. SPUDICH (Albert Einstein College of Medicine, Bronx, NY) and R. A. BOGOMOLNI (California, University, San Francisco, CA) Nature (ISSN 0028-0836), vol. 312, Dec. 6, 1984, p. 509-513. refs

(Contract NIH-GM-27750; NIH-GM-27057; NSG-7151; NSF PCM-83-16139)

A photosensitive protein resembling the visual pigments of invertebrates enables phototactic archaebacteria to distinguish color. This protein exists in two spectrally-distinct forms, one of which is a transient photoproduct of the other and each of which undergoes photochemical reactions controlling the cell's swimming behaviour. Activation of a single pigment molecule in the cell is sufficient to signal the flagellar motor. This signal-transduction mechanism makes evident a color-sensing capability inherent in the retinal/protein chromophore. Author

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 279)

JANUARY 1986

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LIFE SCIENCES (GENERAL)

Includes genetics.

A85-47176
INTERNATIONAL UNION OF PHYSIOLOGICAL SCIENCES, COMMISSION ON GRAVITATIONAL PHYSIOLOGY, ANNUAL MEETING, 6TH, UNIVERSITE DE LAUSANNE, LAUSANNE, SWITZERLAND, SEPTEMBER 18-21, 1984, PROCEEDINGS
Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, 159 p. For individual items see A85-47177 to A85-47232.

The topics covered by the present Conference include problems of gravitational physiology, bioregenerative systems, the effects of body position on skeletal circulatory and respiratory function, cardiovascular and respiratory effects of weightlessness in man, gravitational effects on bone and muscle. Also covered are the topics of gravity sensing in animals, physiological effects of space flight, gravity and plant reactions, and general physiological attributes of growth in plants, cells, and invertebrate embryos. Specifically considered were Spacelab and the U.S. biomedical space research program, the European life sciences experiments on the first Spacelab mission, achieving maximum plant yield in a weightless bioregenerative system for a spacecraft, plasma catecholamines and central hemodynamics during simulated zero gravity in humans, the effect of microgravity on prenatal development of mammals, gravity-induced asymmetric distribution of a plant growth hormone, and tissue densities in developing avian embryos. I.S.

A85-47177#
PROBLEMS OF GRAVITATIONAL PHYSIOLOGY AND THEIR SOLUTION IN COSMOS FLIGHTS
E. A. ILLIN and O. G. GAZENKO (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-3 to S-6. refs

The effects of weightlessness on the structure and function of various physiological systems were studied using rats and rhesus monkeys flown in a series of Cosmos biosatellites. In rats, no pathological changes were detected after 18-22 d flights, while the recorded fluid-electrolyte changes were similar to those of man, as were the changes in the skeleto-muscular segments involved in the maintenance of tonus and posture. These changes were normalized after a 25-27 d postflight recovery period. The adverse effects of exposure to gamma-radiation (200 and 800 rad from Cs-137) were not modified by weightlessness. In monkeys, the recorded physiological changes during the 5 days of flight involved the vestibular apparatus and the muscle system, with no significant cardiovascular changes. The general health state of both rats and monkeys was not affected by the orbital flights. I.S.

A85-47178#
SPACELAB AND THE U.S. BIOMEDICAL SPACE RESEARCH PROGRAM
J. B. WEST (California, University, La Jolla) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-7, S-8.

Among the many multidisciplinary experiments carried out onboard Spacelab 1 (in 1983) with the participation of the scientific communities of Canada, Japan and Western Europe, studies of the physiological effects of weightlessness produced many significant findings. Evidences of altered circadian rhythm in Neurospora, reduced activation of lymphocytes exposed to concanavalin A, poorer mass discrimination by the crew, lowering of the venous pressure, and especially the occurrence of caloric nystagmus are some of the findings discussed. The projected Spacelab 3 mission will test sophisticated measurement systems for various physiological parameters, while Spacelab 4 will be dedicated to physiolcgical and biochemical studies of body systems (vestibular, cardiovascular/pulmonary, renal/endocrine, blood, bone, and muscle), and to experiments in gravitational biology. I.S.

A85-47179#
ON THE RESEARCH ACTIVITIES IN THE FIELDS OF GRAVITATIONAL PHYSIOLOGY AND THE SPACE LIFE SCIENCES PROGRAM IN JAPAN
H. SAIKI (St. Marianna University, Kawasaki, Japan) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-9 to S-12. refs

Japan's Professional Societies involved in the fields of gravitational physiology (GP) and space life sciences (SLS) are listed, and their activities, particularly in reference to the January-February 1985 Space Shuttle mission, are described. The experiments selected by the Space Shuttle Utilization Committee of NASDA, designed to study the bio-medical effects of zero gravity include the electrophoretic separations of cells and biosubstances, enzyme crystallization, genesis and growth of bone and cartilage, and metabolic and physiologic changes in the bodies of the astronauts (changes in the visual-vestibular and locomotive behaviors, sensory-motor functions, and the stability of the visual function). Also planned were the assessment of the effects of space radiation and possible countermeasures. International cooperation, stressed in view of the vastness of GP, is realized through the periodic meetings of the International Symposium, Space Technology and Science, Tokyo, and joint space missions. I.S.

A85-47180#
THE EUROPEAN LIFE SCIENCES EXPERIMENTS ON THE FIRST SPACELAB MISSION - A SUMMARY REPORT
H. OSER (ESA, Life Science, Microgravity Office, Paris, France) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-13 to S-16.

An account of the life-science experiments conducted by a European team on Spacelab 1 is presented. The experiments include studying the effect of weightlessness on ballistocardiogram records, central venous pressure, EOG, ECG, and EEG records, the vestibular mechanism, and the lymphocyte proliferation after activation with concanavalin A. Preliminary analyses of the preflight, inflight, and postflight data disclose an unexpected decrease in venous pressure soon after takeoff, and the presence of the caloric nystagmus (suggesting that mechanisms other than thermal convection are responsible for its occurrence). Depression of activation of lymphocytes supports previous findings on the effect of gravity on cell division. Other studies covered determination of the effects of high charge and high energy cosmic radiation (BIOSTACK experiment), UV radiation, and vacuum upon microorganisms. Increased sensitivity to UV under vacuum condition was noted. I.S.

A85-47181#
EFFECT OF GRAVITY ON NEURAL OUTFLOW FROM THE CENTRAL RESPIRATORY AND VASOMOTOR CONTROL MECHANISMS IN THE RABBIT
T. HUKUHARA, N. KIMURA, and K. TAKANO (Jikei University, Tokyo, Japan) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-17 to S-20. refs

The effects of postural changes on the cardiac and respiratory rhythms in the renal sympathetic nerve activity, the respiratory rhythm and high frequency oscillation in the phrenic nerve activity, and the phase relation between respiratory volleys in both nerve activities were quantitatively analyzed in rabbits by means of power spectrum and pulse-weight correlation. Rabbits were vagotomized, paralyzed, and maintained by artificial ventilation. It was found that both head-up (30-45 deg) and head-down (30 deg) tilting caused increases in the end-tidal CO2 concentration, and in the total power of renal sympathetic and phrenic activities, as well as a prolongation of the period of the phrenic respiratory discharge. Head-down tilting intensified cardiac rhythm in the renal sympathetic nerve activity. During the head-up (but no the head-down) position, the respiratory discharge in the renal sympathetic nerve activity became more regular, and shifted from the inspiratory-expiratory phase-spanning phase toward the inspiratory phase. I.S.

A85-47186#
EFFECTS OF NON-WEIGHT BEARING ON FRACTURE HEALING
J. R. SWEENEY, G. J. MARSHALL, H. GRUBER, and M. E. KIRCHEN (Southern California, University, Los Angeles, CA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-35, S-36.

Fracture healing in rat fibula under conditions of weight bearing (WB) and nonweight bearing (NWB) was studied, utilizing an inverted suspension cage to imitate human traction. In the NWB rats, compared to the WB animals, the fracture healing was characterized by increased osteopenia, delayed callus remodeling, and increased vascularization and abnormal remodeling of the associated cortex. With the delay of callus there was also a delay in chondro- and osteogenesis. Cartilate islands were present in the WR rats at 9-18 days, and in the NWB rats at 36 days. Thus, the weight bearing is essential for appropriate callus formation, early chondro- and osteogenesis, and normal mineralization. I.S.

A85-47187*# California Univ., San Diego.
TISSUE FLUID SHIFT, FORELIMB LOADING, AND TAIL TENSION IN TAIL-SUSPENDED RATS
A. R. HARGENS, J. STESKAL, C. JOHANSSON, and C. M. TIPTON (California, University; U.S. Veterans Administration, Medical Center, San Diego; Arizona, University, Tucson) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-37, S-38. Research supported by the U.S. Veterans Administration and NASA. refs

The tail suspension model (head-down tilt) simulates hypogravity in terms of musculoskeletal loss in the rat. However, little is known of tissue fluid shifts and body weight distribution in this model. Tissue fluid pressures were measured by wick catheters in 12 Munich-Wistar rats before, during, and after 48 hrs of tail suspension (about 30 deg head-down tilt). Subcutaneous tissue fluid pressure in the neck increased from -2.2 + or - 0.4 (normal horizontal position) to +4.0 + or - 1.5 cm H2O during tail suspension, indicating a cephalic fluid shift and significant edema during head-down tilt. In a separate study, six rats were suspended at 30-70 deg, and forelimb load and tail tension were measured by a balance and force transducer, respectively. Approximately 50 percent of body weight (BW) was loaded on forelimbs at a head-down tilt angle of 30 deg and forelimb load declined linearly to 10 percent BW at 70 deg. Furthermore, tail tension increased from 50 percent BW at 30 deg to 85 percent BW at 70 deg. These results indicate that less than normal loads are applied to forelimbs of rats suspended at angles of less than 30 deg and that the tail bears an increasing proportion of the rat's body weight at head-down tilt angles of less than 30 deg. Author

A85-47188*# Louisville Univ., Ky.
THYMIC INVOLUTION IN THE SUSPENDED RAT MODEL FOR WEIGHTLESSNESS - DECREASED GLUCOCORTICOID RECEPTOR CONCENTRATION
J. M. STEFFEN and X. J. MUSACCHIA (Louisville, University, KY) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-39, S-40. refs
(Contract NAGW-70; NSG-2325)

Hindlimb muscle atrophy, thymic involution and adrenal hypertrophy in rats during spaceflight can be simulated using suspension models. Skeletal muscle and thymus are sensitive to gluco-corticoids (GC), and previous studies have demonstrated that muscle atrophy in suspended rats is associated with increased GC receptor concentration. The objectives were to confirm thymic involution during suspension, and determine if involution correlated with increased GC receptor concentration. Seven days of antiorthostatic (AO) suspension of rats produced a significant (P less than 0.001) reduction in thymic wet weight not associated with an alteration of percent water content. GC receptor concentration (pmol/mg protein) decreased 20 percent (P less than 0.025) in thymus glands from 7 day AO suspended rats. Suspension, therefore, is associated with involution of the thymus, but this is not dependent upon AO positioning. Thymus GC receptor concentrations were depressed in 7-day suspended rats, in contrast with previous observations on skeletal muscle, suggesting that different mechanisms may underlie these responses. Author

A85-47189*# Louisville Univ., Ky.
CARDIOVASCULAR AND HORMONAL (ALDOSTERONE) RESPONSES IN A RAT MODEL WHICH MIMICS RESPONSES TO WEIGHTLESSNESS
X. J. MUSACCHIA and J. M. STEFFEN (Louisville, University, KY) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-41, S-42. refs
(Contract NSG-2325)

Cardiovascular responses and fluid/electrolyte shifts seen during spaceflight have been attributed to cephalad redistribution

of vascular fluid. The antiorthostatic (AO) rat (suspended, head-down tilt of 15-20 deg) is used to model these responses. This study documents that elevated blood pressures in AO rats are sustained for periods of up to seven days, compared with presuspension values. Increased blood pressures in AO rats suggests a specific response to AO positioning, potentially relatable to a cephalad fluid shift. To assess a role for hormonal regulation of sodium excretion, serum aldosterone levels were measured. Circulating aldosterone concentrations were seen to increase approximately 100 percent during seven days of AO suspension, concurrently with a pronounced natriuresis. These results suggest that aldosterone may not be involved in the long term regulation of increased Na(+) excretion in AO animals. These studies continue to show the usefulness of models for the development of animal protocols for space flight. Author

A85-47190#
ARTERIAL PRESSURES, FLUID ENERGY, POSTURE AND + GZ ACCELERATIONS
P. BORREDON, F. PAILLARD, and P. LISCIA (Centre d'Etudes et de Recherches de Medecine Aerospatiale, Paris, France) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-43, S-44.

The effect of sustained high Gz acceleration on the cardiovascular functional state was studied in rabbits subjected to repeated centrifugal acceleration at 8-9 Gz. The arterial femoral pressure (AP), the left ventricular pressure (LVP), measured on the day following the last exposure, and the myocardial concentrations of ATP, ADP, AMP, creatine phosphate (CP), and glycogen were determined in groups of centrifuged and restrained, restrained only, and control animals. In the centrifuged rabbits, the diastolic AP, and the maximum rate of rise of LVP increased significantly, whereas the systolic AP and the systolic LVP increased in both centrifuged and restrained rabbits, indicating that the two types of arterial hypertension were determined by two types of stress, centrifuge and restraint. The myocardium of the centrifuged animals was significantly depleted in glycogen, and showed smaller decreases in ATP and CP. These observations show the stress imposed on the myocardium, and the persistence of sympathetic response after repeated exposure to high sustained +Gz. I.S.

A85-47192#
THE LUNGS, 'ACHILLES HEAL', OF AIR BREATHERS IN CHANGING GRAVITATIONAL-INERTIAL FORCE ENVIRONMENTS
E. H. WOOD and E. A. HOFFMAN (Mayo Medical School, Rochester, MN) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-47, S-48. refs

The differences between the almost zero specific gravity of the intraalveolar gases and the specific gravity of the surrounding blood and tissue, create interpleural pressures that are magnified at high levels of acceleration. It has been shown (Wood et al., 1963) that the magnitude of the expansile musculature-gerated forces increases with the vertical height of the thorax, and that there exist large vertical gradients (about 0.7 cm H2O/cm vertical height) in pleural liquid pressures. It is suggested that the vertical gradient in the interserosal force environment which surrounds the lungs is a causative factor of the differences, with respect to vertical level in the thorax, of lung strains, perfusion, and ventilation, which occur at 1 G. These differences are presumably magnified during the launch and the reentry phases of the space flight, and perhaps cease at zero G. I.S.

A85-47204*# California Univ., Berkeley.
MUSCULARITY AS A FUNCTION OF SPECIES, SEX AND AGE IN SMALL MAMMALS
N. PACE, D. F. RAHLMANN, and A. H. SMITH (California, University, Berkeley) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-71, S-72. refs
(Contract NSG-7336)

Changes in the body skeletal muscle mass SMM (measured as a function of the ratio between the body creatine mass and the fat-free muscle creatine), and in muscularity (expressed as the ratio of SMM to fat-free body mass) were studied as functions of age, sex, and species in mouse, rat, hamster, guinea pig, and rabbit. Six animals of each sex were examined in eight age cohorts ranging from 1 to 24 months. Both species and age factors affect SMM. Strong sexual dimorphism in the SMM changes with age was displayed by mouse, rat, and guinea pig, whereas the hamster and rabbit were statistically monomorphic. The mouse, rat, and hamster attain a maximal SMM at about 1 year of age, whereas in the guinea pig and rabbit the decrease in SMM starts after 2 years. The value of muscularity reached a peak at age of 2-3 months in all animals of both sexes, with a pronounced difference among the species. The mouse emerged as the most muscular, while the guinea pig the least muscular, of all species. I.S.

A85-47205*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ACTIVITY OF CALCIUM ACTIVATED PROTEASE IN SKELETAL MUSCLES AND ITS CHANGES IN ATROPHY AND STRETCH
S. ELLIS and P. A. NAGAINIS (NASA, Ames Research Center, Moffett Field, CA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-73, S-74. refs

The reduction of protein content in skeletal muscle undergoing disuse-induced atrophy is correlated with accelerated rates of protein degradation and reduced rates of protein synthesis (Goldspink, 1977). It is not known in what manner myofibers are partially disassembled during disuse atrophy to fibers of smaller diameter; nor is it known which proteases are responsible for this morphological change in contractile protein mass. Dayton and colleagues (1975) have suggested that the Ca(2+)-activated protease (CaP) may initiate myofibril degradation. The discovery of a form of CaP that is activatable by nano-molar concentrations of Ca(2+) indicates that CaP activity may be regulated by physiological concentrations of Ca(2+) (Melgren, 1980). The enhancement of proteolysis by the Ca(2+) ionophore A23187, reported by Etlinger (1979), is consistent with a significant role for CaP in protein degradation. It was of interest, therefore, to measure the levels of CaP activity and the CaP inhibitor in extracts obtained from skeletal muscles of rat and chicken limbs undergoing disuse atrophy or stretch hypertrophy, respectively. Author

A85-47206*# Texas Univ., Houston.
EFFECTS OF CHRONIC CENTRIFUGATION ON MICE
L. JANER and J. DUKE (Texas, University, Houston) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-75, S-76. refs
(Contract NAGW-438)

Previous studies have shown that exposure to excess gravity in vitro alters the developmental sequence in embryonic mouse limbs and palates (Duke, Janer and Campbell, 1984; Duke, 1983). The effects of excess gravity on in vivo mammalian development was investigated using a small animal centrifuge. Four-week old female mice exposed to excess gravities of 1.8-3.5 G for eight weeks weighed significantly less than controls. Mice were mated after five weeks of adaptation to excess G, and sacrificed either at gestational day 12 or 18. There were fewer pregnancies in the

centrifuged group (4/36) than in controls (9/31), and crown rump lengths (CRL) of embryos developing in the centrifuge were less than CRLs of 1-G embryos. These results show that although immersed in amniotic fluid, embryos are responsive to Delta-G. Author

A85-47207*# Texas Univ., Houston.
ACCELERATION OF FUSION IN MOUSE PALATES BY IN VITRO EXPOSURE TO EXCESS G
J. DUKE, L. JANER, and M. CAMPBELL (Texas, University, Houston) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-77, S-78. refs
(Contract NAGW-438)

Palatal shelves from 13- and 14-day mouse embryos were excised and cultured in contiguous pairs. Experimental cultures were exposed to 2.6 G in a culture centrifuge; controls were in the same incubator. After 24 hours, palates were prepared for light or electron microscopy. Scoring of paraffin sections according to the stage of fusion seen in the medial epithelial edges (MEE) showed that palates exposed to excess G were in more advanced stages of fusion than were controls. Ultrastructurally, control MEE had tightly apposed cell membranes and numerous desmosomes; in centrifuged MEE, desmosomes had been removed and there was much intercellular space. Nuclear membranes were intact in control MEE, but showed marked deterioration in MEE of centrifuged palates. Few lysosomes and no necrosis were seen in control MEE; centrifuged MEE had numerous lysosomes as well as necrotic cells. Basal lamina were intact in controls, but interrupted in centrifuged palates. The results confirm the hypothesis that gravitational increases speed up the differentiative process. Author

A85-47208#
READAPTATION OF RAT'S MUSCLES FOLLOWING SPACE FLIGHT
T. SZILAGYI, M. RAPCSAK, A. SZOOR (Szegedi Orvostudomanyi Egyetem, Szeged, Hungary), V. S. OGANOV, and S. A. SKURATOVA (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-79, S-80. refs

Muscle readaptation in rats used in the Cosmos-1129 flight (the flight group F) was studied. Aliquot numbers of animals from the F, a synchronous and a vivarium control group were sacrificed on days 0, 6, and 29 after landing. Four muscle groups of different types: m. soleus, a slow-fiber muscle, m. extensor digitorum longus (EDL), a fast-fiber muscle, and the brachial and triceps (medial head), intermediate type muscles, were weighed, and their contraction and tension measured. The muscles, depending on their function, behaved differently in response to exposure to zero gravity. The degree of weight loss was highest in m. soleus, and lowest in m. EDL. The m. EDL regained its weight much faster (day 6) than m. soleus and the triceps (day 29). Similarly, the recovery of maximum tension (lowered in response to 0 G) and contraction velocity was much faster in m. EDL than in m. soleus. Significantly, the contraction velocity of m. soleus showed an increase instead of a decrease (noted for the other muscles) on exposure to zero gravity. I.S.

A85-47209*# Columbia Univ., New York.
ALTERATIONS IN BONE FORMING CELLS DUE TO REDUCED WEIGHT BEARING
S. B. DOTY (Columbia, University, New York) and E. MOREY-HOLTON (NASA, Ames Research Center, Moffett Field, CA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-81, S-82. refs
(Contract NAGW-238)

A reduction in new bone formation occurred as a result of space flight (Cosmos 1129) and in the suspended animal model of Morey-Holton (1979, 1980). The results indicate that alkaline phosphatase activity of the bone-forming cells is also reduced under these conditions, and the cells in the diaphysis are more affected than those in the metaphyseal region. In addition, these cells show (1) reduced proline incorporation into bone matrix, and (2) increased intracellular lysosomal activity. A change in the cytoskeleton could be the common factor in explaining these results. This suggestion is futher supported by the previous observations that colchicine injections result in decreased osteoblastic function. Author

A85-47210#
FACTORS INFLUENCING MUSCLE MASS IN THE RAT AT 1.0 AND MULTIPLE G'S
G. C. PITTS (Virginia, University, Charlottesville) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-83, S-84. refs

Using 16 samples of rats, 13 at terrestrial gravity and three subject to chronic centrifugation, product-moment correlation coefficients among individuals between mass of muscle and A (live mass - FFBM) and B (FFBM - muscle mass), where FFBM is fat-free body mass, have been calculated. Parameter A represents the inert load to be carried, and yielded no significant correlations with mass of muscle. Correlations with parameter B test whether muscle maintains a constant mass relationship to the rest of the fat-free compartment and yielded significant positive correlations in eight of the 13 samples at terrestrial gravity, and in none at elevated chronic accelerations. It was concluded that the mass of muscle was not significantly correlated with the inert load being carried, even at 4.15 g, but was correlated with the masses of other components in the FFB, and that physical exercise and changes in diet did not disrupt these relationships, but increases in chronic acceleration probably did disrupt them. Author

A85-47211*# Michigan Univ., Ann Arbor.
GRAVITY RECEPTORS - AN ULTRASTRUCTURAL BASIS FOR PERIPHERAL SENSORY PROCESSING
M. D. ROSS and K. DONOVAN (Michigan, University, Ann Arbor) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-85, S-86. refs
(Contract NAS2-10535; NSG-9047)

The present ultrastructural study of serial sections has shown that type II hair cells of the anterior part of the utricular macula are integrated into the afferent neural circuitry of type I cells, which are arranged in clusters. Additionally, there exists a complex system of intramacularly originating efferent-type nerve fibers and terminals. The findings, taken together, suggest that on morphological grounds, complex processing of sensory information occurs in gravity receptors. Asymmetry of such a complex system may contribute to motion and space-motion sickness. Author

A85-47212#
THE EFFECTS OF GRAVITY ON THE VERTICAL VESTIBULO-OCULAR RESPONSE OF THE MONKEY
M. J. CORREIA, A. A. PERACHIO (Texas, University, Galveston), and A. R. EDEN (Mount Sinai Medical Center, New York) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-87, S-88. refs
(Contract N00014-76-C-0822; NR PROJECT 201-185)

The effect of sinusoidal oscillation (at the frequencies of 0.01, 0.10, and 1.00 Hz), about a vertical axis and about an axis tipped 45 deg, on the vestibuloocular response of the monkey was investigated. The animals were prepositioned so that angular acceleration acted in the sagittal head plane and produced a vertical nystagmus. Two conditions were used during both rotation schemes: with eyes open and viewing a well lit room and with eyes open in the dark. Vertical nystagmus was analyzed by scoring the upward slow and the downward slow phase velocities (SPV) and by determining gain and phase between peak SPV and the rotator velocity. The results on calculated gain and phase relations between head velocity and eye velocity indicate that the simultaneously acting optokinetic stimulation and the changing gravitational linear acceleration do modify gain and phase relations between head velocity and vertical eye velocity produced by angular acceleration. I.S.

A85-47213*# California Univ., Davis.
FAR-FIELD BRAINSTEM RESPONSES EVOKED BY VESTIBULAR AND AUDITORY STIMULI EXHIBIT INCREASES IN INTERPEAK LATENCY AS BRAIN TEMPERATURE IS DECREASED
L. F. HOFFMAN and J. M. HOROWITZ (California, University, Davis) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-89, S-90. refs
(Contract NSG-2234)

The effect of decreasing of brain temperature on the brainstem auditory evoked response (BAER) in rats was investigated. Voltage pulses, applied to a piezoelectric crystal attached to the skull, were used to evoke stimuli in the auditory system by means of bone-conducted vibrations. The responses were recorded at 37 C and 34 C brain temperatures. The peaks of the BAER recorded at 34 C were delayed in comparison with the peaks from the 37 C wave, and the later peaks were more delayed than the earlier peaks. These results indicate that an increase in the interpeak latency occurs as the brain temperature is decreased. Preliminary experiments, in which responses to brief angular acceleration were used to measure the brainstem vestibular evoked response (BVER), have also indicated increases in the interpeak latency in response to the lowering of brain temperature. I.S.

A85-47214#
THE CHEMORECEPTOR TRIGGER ZONE FOR VOMITING IS NOT ESSENTIAL FOR MOTION SICKNESS IN CATS
H. L. BORISON, R. BORISON, L. E. MCCARTHY, A. MANDAL, and T. J. FISK (Dartmouth Medical School, Hanover, NH) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-91, S-92. refs

The emetic chemoreceptor trigger zone (CTZ) in the area postrema of the medulla oblongata is generally thought to be indispensable for the mediation of motion sickness. The susceptibility to motion-induced vomiting of normal cats was compared with that of cats in which the area postrema was chronically ablated. Effective destruction of the CTZ was established by loss of emetic sensitivity to i.v. deslanoside and by postmortem histological confirmation of the lesion. The cats were subjected to vertical sinusoidal motion on a spring-suspended platform driven manually at about 30 cpm through excursions of 30 in. for no longer than 30 min. With repeated testing, vomiting occurred in 7 of 8 postrema-ablated cats (mean latency of 8.5 min) by comparison with 13 of 26 normal cats (mean latency of 12 min). Two of the lesioned cats vomited in all of four and seven trials, respectively. No remarkable difference of responsiveness was found between operated and normal cats. Hence, the CTZ is not indispensable for motion-induced vomiting. Author

A85-47215*# California Univ., Davis.
THE PRIMATE CIRCADIAN TIMEKEEPING SYSTEM IN A HYPERDYNAMIC ENVIRONMENT
C. A. FULLER (California, University, Davis) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-93, S-94. refs
(Contract NAGW-309)

The effect of hyperdynamic field (12 d at 1.5 G and 35 d at 2.0 G phases, preceded and followed by 1.0 G phases of 15 and 18 days, respectively) on the circadian rhythm in the feeding and drinking of the squirrel monkey was studied. Two lighting regimens were employed: (1) the 24-hr light-dark cycle (LD 12:12) at all G phases and (2) constant light (LL) during the two 1.0 G phases and a 2.0 G phase. In the LD regimen, both feeding and drinking rhythms were entrained with the 24-hr periods at all G levels, but a phase delay occurred in high G environment. In the LL regimen, the rhythm persisted with a free-running period greater than 24 hours and an increase at 2.0 G, compared to the 1.0 G phases. Thus, although the circadian rhythm is functional at high G, some of its components appear to be regulated at different homeostatic levels. I.S.

A85-47216*# California Univ., Riverside.
PRIMATE BODY TEMPERATURE AND SLEEP RESPONSES TO LOWER BODY POSITIVE PRESSURE
D. M. EDGAR and C. A. FULLER (California, University, Riverside) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-95, S-96. refs
(Contract NAGW-309)

Cephalic fluid shifts, induced by lower body positive pressure (LBPP) are known to influence various physiological systems (i.e., cardiovascular and renal). In earlier experiments, an apparent change in the arousal state of primates in such LBPP conditions was observed. This study was designed to examine the effects of LBPP on arousal state and body temperature level which is normally correlated with sleep. Chair-restrained male squirrel monkeys were exposed to 40 mmHg LBPP for 90-100 minutes between the daytime hours of 13:00-15:00. Each monkey was placed in a specially modified restraint chair to which they were highly trained. Deep body temperature (DBT) was collected from 10 animals. Sleep parameters were obtained from six animals chronically implanted for sleep recording. A video camera was used to observe each animal's apparent state of arousal. LBPP resulted in an approximate 0.9 C decrease in DBT. During video observation, some animals appeared drowsy during LBPP; however, sleep recording revealed no significant changes in the state of arousal. Thus, LBPP is capable of inducing a mild hyperthermia. Further, the mechanisms underlying the observed lowering of body temperature appear to be independent of arousal state. Author

A85-47217*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

CORE TEMPERATURE OF TAILLESS RATS EXPOSED TO CENTRIFUGATION

C. B. MONSON and J. OYAMA (NASA, Ames Research Center, Moffett Field, CA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-97, S-98. Navy-supported research. refs

The role of the tail in the altered thermoregulation of rats during acute exposure to hypergravity was investigated, using groups of rats of two ages: 55 days (young) and 138 days (old). Rectal and foot temperature changes were measured in intact and tailless rats subjected to 1 h centrifugation of 2.8 G, with preceding (1 h) and following (1-3 h) 1 G periods. At 22 C, the loss of body heat from the tail per se does not measurably contribute to the hypothermia induced by hypergravity. However, the heat loss from the feet was greater in the tailless rats than in the intact rats from the young group of animals, although there was no significant difference between the tailless and intact rats in the old animal group. It is concluded that the inhibition of heat production is a significant factor in the hypothermia of centrifuged tailless rats, as it has been previously shown to be in the intact animals. I.S.

A85-47218*# Columbia Univ., New York.

EFFECTS OF CLINOSTAT ROTATION ON MOUSE MEIOTIC MATURATION IN VITRO

D. J. WOLGEMUTH and G. S. GRILLS (Columbia University, New York) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-99, S-100.
(Contract NAGW-346)

The effects of microgravity on meiosis, fertilization, and early embryonic development in mammals are being examined by using a clinostat to reorient the cells with respect to the gravity vector. A clinostat capable of supporting mammalian cells in tissue culture has been developed. Initial studies have focused on examining the effects of clinostat rotation on meiotic maturation in mouse oocytes. Oocytes recovered from ovarian follicles were subjected to clinostat rotation on a horizontal or vertical axis or to static conditions for a 16 hr period. No gross morphological changes and no effects on germinal vesicle breakdown were observed under any rotation conditions (1/4, 1, 10, 30, 100 RPM). Success of meiotic progression to Metaphase II was comparable among experimental and control groups except at 100 RPM, where a slight inhibition was observed. Author

A85-47219#

METABOLIC EFFECTS OF VARIOUS INTENSITY OF MAGNETIC FIELDS ON THE ALBINO RATS UNDER DIFFERENT DYNAMICS

H. SAIKI, M. SUDOH, M. NAKAYA, M. ABE, M. KOHNO (Jikei University, Tokyo, Japan) et al. (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-101, S-102.

The biological effects of magnetic fields of different intensities (LM, 4 mOe; GM, 600 mOe; and HM, 200 Oe) were studied in rats maintained in different dynamic states: hypodynamic (LD), normal (ND), and hyperdynamic (HD). Among the changes of various physiological parameters measured before, during, and after the 3-4 weeks of conditioning, there was a decrease in body weight in the LD group under LM and HM; a large decrease in resting metabolic rate in the ND group under both LM and HM conditions; an increase in the urinary volume in ND group, but a decrease in the LD group under LM. The K(+) and Na(+) excretion rates in the ND group decreased under HM, but increased under LM; in the LD group this relation was inverted; the excretion rate of Ca(2+) in LD under LM decreased strongly, attenuating the action of LD. The relationship between the magnetic field intensity and the urinary excretion rate for Ca(2+) in ND and LD animals can be expressed by a curvilinear regression line, with maxima at the magnetic field values specific for each state. I.S.

A85-47221#

THE EFFECT OF MICROGRAVITY ON THE PRENATAL DEVELOPMENT OF MAMMALS

L. V. SEROVA, L. A. DENISOVA, V. F. MAKEEVA, N. A. CHELNAIA, and A. M. PUSTYNNIKOVA (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-107 to S-110. refs

The effects of microgravity (5 days exposure during the 13-18 days of gestation) on the prenatal and postnatal development of mammals were studied using pregnant rats on board Cosmos-1514. The adverse effects on pregnant rats include a decreased weight gain (5 g vs 65 g for control); decreases in hemoglobin concentration (Hb), thymus weight, and liver weight; and reductions of size and weight of the placenta. The total number of alive fetuses and fetal mortality rate were normal. The only effects noted in the fetuses were 10 percent weight decrease, 5-20 percent reduction in ossified bone area, and an increased water content. Four of the five rats allowed to survive gave birth to normal pups. The only abnormalities noted in the flight newborns were decreases in liver weight and Hb. There was 19 percent mortality among the flight newborns in the first week, as opposed to zero mortality of controls, but the development was not affected. The offspring of flight rats (both parents) were normal, except for an increased (as high as 12 percent) mortality in the first week. I.S.

A85-47222#

THE EFFECT OF WEIGHTLESSNESS ON MOTOR AND VESTIBULO-MOTOR REACTIONS

I. B. KOZLOVSKAIA, B. M. BABAEV, V. A. BARMIN, I. I. BELOOZEROVA, IU. V. KREIDICH (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) et al. (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-111 to S-114. refs

Changes in the vestibulooculomotor interaction and in the musculoskeletal movements were measured during the five day flight onboard Cosmos-1514. Parameters of the gaze-fixation reaction and of muscular activity, during the precise lever pressing by a primate trained to perform specific acts, were recorded 2 and 24 h before launch and compared with periodically made inflight measurements. Three types of motor disorders were distinguished. Within several hours of launch there was a drastic decrease of muscle efforts, particularly in muscles of the calf rear group, presumably caused by the decline of muscle tone. On the second day of flight EMG amplitude and duration increased significantly, while the kinematic parameters of the motor response returned to norm. At late stages of flight, a gradual development of ataxis occurred, brought about by a decrease in functioning of central program mechanisms due to disturbances in the proprioceptive afferent inflow. I.S.

A85-47223#

STATOCYTES AS GRAVIPERCEPTORS

D. J. OSBORNE (AFRC Weed Research Organization, Oxford, England) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-115, S-116. refs

Orientation of plant parts in relation to the gravity vector is achieved by the operation of asymmetric growth in the immature regions. When negatively gravitropic organs (shoots) are displaced from the vertical, growth is enhanced on the lower side with respect to gravity and/or reduced upon the upper side until the organ is

returned to the preferred position. The reverse is true for positively gravitropic organs (roots). In higher plants the gravity sensing tissues possess a limited number of specialized cells (statocytes) containing sedimentible membrane-enclosed amyloplasts (statoliths). Statocytes are differentiated only in precise locations in the plant and in close positional association with certain other cell types. Statoliths normally occupy the lowest part of the statocyte with respect to the gravitational force. On re-orientation of an organ the movement and/or repositioning of statoliths is transduced to biochemical messages through changes in the electrical potential across perturbated membranes. These events set in train a local control of hormone production and cell growth that leads to the preferred gravipositioning of the organ. Author

A85-47224*# Michigan State Univ., East Lansing.
GRAVITY-INDUCED ASYMMETRIC DISTRIBUTION OF A PLANT GROWTH HORMONE
R. S. BANDURSKI, A. SCHULZE, and Y. MOMONOKI (Michigan State University, East Lansing) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-123 to S-126. refs
(Contract NAGW-97; NSF PCM-82-04017)

Dolk (1936) demonstrated that gravistimulation induced an asymmetric distribution of auxin in a horizontally-placed shoot. An attempt is made to determine where and how that asymmetry arises, and to demonstrate that the endogenous auxin, indole-3-acetic acid, becomes asymmetrically distributed in the cortical cells of the Zea mays mesocotyl during 3 min of geostimulation. Further, indole-3-acetic acid derived by hydrolysis of an applied transport form of the hormone, indole-3-acetyl-myo-inositol, becomes asymmetrically distributed within 15 min of geostimulus time. From these and prior data is developed a working theory that the gravitational stimulus induces a selective leakage, or secretion, of the hormone from the vascular tissue to the cortical cells of the mesocotyl. Author

A85-47225#
THE EFFECT OF CLINOSTAT ROTATION ON PROTOPLAST REGENERATION
T.-H. IVERSEN and C. BAGGERUD (Trondheim, Universitetet, Norway) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-127 to S-130.

Cell wall free plant cells - protoplasts - have been rotated for varying periods of time on a slow (4 rpm) and fast (50 rpm) rotating horizontal clinostat. After rotation the protoplasts have been cultivated in a nutrient medium and differences in mitotic activity have been found between protoplasts rotated on the slow and fast clinostat. During regeneration to mature plants there are apparently no morphological differences between the test groups and the non-rotated control. Preliminary results from a cytogenetical analysis and electrophoretic determination of the isoenzyme pattern in mature plants indicate minor changes as a result of the clinostat rotation of the protoplasts. Author

A85-47226#
LIGHT-INDUCED GRAVITROPIC RESPONSIVENESS IN ZEA PRIMARY ROOTS
T. FUJII (Tsukuba, University, Sakura, Japan) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-131 to S-134.

The induction by light of gravitropic response in Zea primary roots was governed by the 'all-or-none law'. The response was induced by light energies above a threshold value. The action spectrum for this light effect showed a large peak at 650 nm. The effect of red light was not reversed by far-red light. Some reducing agents lowered the threshold value up to about one-third of the control. These results indicated that light may exert 2 functions in the gravitropic response of Zea roots, one being the photochemical transformation of a photoreceptor (not phytochrom and the other being the induction of a reduction state in the tissue. The content (activity) of an unidentified growth inhibitor was highest only in the lower halves of horizontally oriented roots which had been irradiated with red light. This growth inhibitor increased the content of hydroxyproline proteins in the cell wall. This inhibitor may cause the downward curvature by increasing the level of hydroxyproline proteins in lower halves. Author

A85-47227#
ABSCISIC ACID IS NOT NECESSARY FOR GRAVITROPISM BY PRIMARY ROOTS OF ZEA MAYS
R. MOORE (Baylor University, Waco, TX) and J. D. SMITH (Texas A&M University, College Station) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-135, S-136. Research supported by the Texas Agricultural Experiment Station and Baylor University. refs

No abscisic acid (ABA) was detected in roots or leaves of carotenoid-deficient mutants of Zea mays. Similarly, no ABA was detected in roots or leaves of seedlings treated with Fluridone, an inhibitor of carotenogenesis. Primary roots of untreated, Fluridone-treated, and mutant seedlings were strongly graviresponsive. These results indicate that ABA is (1) synthesized via the carotenoid pathway, and (2) not necessary for positive gravitropism by primary roots of Zea mays. Author

A85-47228*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ARABIDOPSIS SEED PRODUCTION LIMITED BY CO2 IN SIMULATED SPACE EXPERIMENTS
T. HOSHIZAKI (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-137, S-138. refs
(Contract NAS7-91o)

Several generations of Arabidopsis thaliana were grown axenically from seed to seed on nutrient agar medium. The Arabidopsis plants produce seeds within 30 days after seeding, when grown either in containers open to the ambient atmosphere or in large sealed jars, but not in sealed test tubes. Moreover, the plant height was directly proportional to the size of the sealed container. Periodic analyses of the CO2 levels in the sealed containers has shown a decrease during the first week, but a tenfold increase in the following weeks. It is speculated that, by the end of the second week, the cotyledons entering the senescence stage would release ethylene into the culture atmosphere with a concomitant release of CO2, which in turn would induce further release of ethylene, hastening the senescence process in other tissues. Thus, in a controlled ecological life-support system of a space station, various components of the plant atmosphere may have to be maintained within the prescribed limits. I.S.

A85-47229*# Indiana Univ., Bloomington.
INFLUENCE OF CLINOSTAT ROTATION ON FERTILIZED AMPHIBIAN EGG PATTERN SPECIFICATION
A. W. NEFF, R. C. SMITH, G. M. MALACINSKI (Indiana University, Bloomington), and H.-M. CHUNG (Seoul National University, Republic of Korea) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-139, S-140.
(Contract NAGW-60)

Pattern specification in fertile Xenopus eggs rotated on horizontal clinostats was monitored with respect to primary embryonic axis formation, subsequent morphogenesis, and

compartmentalization of the cytoplasm. At the speeds of 1 to 24 rpm (which are believed to simulate microgravity) a large percentage of eggs developed normal axial structures. Eggs clinostated at 12 rpm showed a randomization of dorsal/ventral polarity. The cytoplasmic compartments showed some clinostat effects but no abnormal mixing, disruption or dislocation of compartments. It is predicted that Xenopus eggs fertilized and allowed to develop in space will retain normal cytoplasmic density compartments, establish primary axes and undergo normal morphogenesis in space. Their dorsal/ventral polarity may not, however, be determined by the sperm entrance site (as is the case for 1 g eggs). Author

A85-47230*# California Univ., Davis.
TISSUE DENSITIES IN DEVELOPING AVIAN EMBRYOS
A. H. SMITH, U. K. ABBOTT, and A. MORZENTI (California, University, Davis) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-141, S-142. refs
(Contract NSG-7493)

The density changes in the components of the incubated egg, the embryo, and the embryo's body parts were measured in the course of 21 days of incubation. In the first two-thirds of the incubation period there is a sequence of increasing density among egg contents: amniotic fluid, embryo, yolk, and albumin. As a result, the embryo is located at the bottom of the amniotic fluid, but at the top of the albumin. This position provides the embryo with mechanical protection and a proximity to the egg's air cell. The observed density changes and the asymmetry of these changes among various body parts of the embryo suggest a functional relationship. The density distributions among the body parts are particularly important in gravitational investigations of embryogenesis since they will produce forces tending to dislocate parts of the embryo. I.S.

A85-47231#
SELECTION OF JAPANESE QUAIL FOR THE HIGH EGG PRODUCTION UNDER HYPODYNAMY
M. JURANI, K. BODA, L. KOSTAL, E. SOMOGYIOVA, D. LAMOSOVA (Slovenska Akademie Vied, Ustav Fyziologie Hospodarskych Zvierat, Ivanka pri Dunaji, Czechoslovakia) et al. (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-143 to S-145. refs

A line of Japanese quail resistant to hypodynamy (14 days of exposure during the egg-laying period) was selected from the parental population, using the criterion of best egg-laying, and bred to the fourth generation. The level of egg-laying increased in each successive filial generation, reaching in the fourth generation 52 percent of the control on the 14th day of exposure, compared with the 16 percent in the parental population. The selection also had a positive effect on the adaptability to hypodynamy with respect to increased weight and rate of growth of quail chick, as well as to diminished fearfulness. The study was conducted in the framework of research on adaptation to the specific conditions of space flight (weightlessness and limited space). I.S.

A85-47232*# Temple Univ., Philadelphia, Pa.
INHIBITION OF THE SPIDER HEARTBEAT BY GRAVITY AND VIBRATION
A. FINCK (Temple University, Philadelphia, PA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-147, S-148. refs
(Contract NAGW-242)

The rate and vigor of the spider heartbeat is controlled by an external pacemaker. A mechanical feature of the spider cardio-vascular system is the production of high serum pressure in the prosoma and the legs. This appears to be the source for leg extension. The lyriform organ on the patella of the leg is sensitive to vibratory and kinesthetic stimuli. This sensitivity depends upon the degree of leg extension. Thus the activity of the heart and the response characteristics of the sense receptor are related. The effect of a supra-threshold vibratory or gravitational stimulus is to produce an inhibition and a tachycardia of the spider heartbeat. Author

A85-48423
THE EFFECT OF HYPERBARIC OXYGENATION ON PARAMAGNETIC CENTERS IN RABBIT CARDIAC MUSCLE DURING EXPERIMENTAL MYOCARDIAL INFARCTION [VLIIANIE GIPERBARICHESKOI OKSIGENATSII NA PARAMAGNITNYE TSENTRY V MYSHTSE SERDSTSA KROLIKA PRI EKSPERIMENTAL'NOM INFARKTE MIOKARDA]
E. N. BURGOVA, A. F. VANIN, E. A. DEMUROV, IU. B. KOLOSKOV, V. V. PROSKORIAKOV (AN SSSR, Institut Khimicheskoi Fiziki, Moscow, USSR) et al. Biofizika (ISSN 0006-3029), vol. 30, July-Aug. 1985, p. 681-685. In Russian. refs

A85-48512* Wisconsin Univ., Madison.
SELF-SELECTION OF A HIGH CALCIUM DIET BY VITAMIN D-DEFICIENT LACTATING RATS INCREASES FOOD CONSUMPTION AND MILK PRODUCTION
R. BROMMAGE and H. F. DELUCA (Wisconsin, University, Madison) Journal of Nutrition (ISSN 0022-3166), vol. 114, 1984, p. 1377-1385. Research supported by the Wisconsin Alumni Research Foundation. refs
(Contract NAG2-167; NIH-AM-14881)

A85-48522* Oslo Univ. (Norway).
EFFECTS OF INTERFERON-ALPHA/BETA AND INTERFERON-GAMMA PREPARATIONS ON PHAGOCYTOSIS BY MOUSE PERITONEAL MACROPHAGES
H. ROLLAG (Oslo, Universitetet, Norway), M. DEGRE (National Institute of Public Health, Oslo, Norway), and G. SONNENFELD (Louisville, University, KY) Scandinavian Journal of Immunology, vol. 20, 1984, p. 149-155. Research supported by the Norwegian Society for Fighting Cancer and Norwegian Cancer Society. refs
(Contract NCC2-213)

A85-50051
THE EFFECT OF ADRENALECTOMY ON THE LIFE DURATION OF RATS SUBJECTED TO HIGH-ALTITUDE HYPOXEMIA AT DIFFERENT TIMES OF THE DAY [WPLYW ADRENALEKTOMII NA CZAS PRZEZYCIA SZCZUROW PODDANYCH NIEDOTLENIENIU WYSOKOSCIOWEMU W ROZNYCH PORACH DOBY]
S. WROBLEWSKI, W. FRIEDENSBERG, and E. KUJAWSKA (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland) Postepy Astronautyki (ISSN 0373-5982), vol. 17, no. 3-4, 1984, p. 29-38. In Polish. refs

A85-50054
CHANCES OF SURVIVAL FOR TRANSCONTINENTAL AND SPACE CREWS IN CASE OF FORCED LANDING IN THE DESERT, THE JUNGLE, OR ON THE OCEAN SURFACE [MOZLIWOSCI PRZEZYCIA ZALOG TRANSKONTYNENTALNYCH I KOSMICZNYCH W RAZIE PRZYMUSOWEGO LADOWANIA W PUSTINI, DZUNGLI I NA POWIERZCHNI OCEANU]
T. BOSZKIEWICZ (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland) Postepy Astronautyki (ISSN 0373-5982), vol. 17, no. 3-4, 1984, p. 89-104. In Polish. refs

A85-50057
EFFECT OF ACCELERATION LASTING SEVERAL HOURS ON THE LEVEL AND PERCENT COMPOSITION OF FREE FATTY ACIDS IN RAT SERUM [WPLYW KILKUGODZINNEGO DZIALANIA PRZYSPIESZEN NA POZIOM I SKLAD PROCENTOWY WOLNYCH KWASOW TLUSZCZOWYCH W SUROWICY KRWI SZCZUROW]
D. GEMBICKA and L. MARKIEWICZ (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland) Postepy Astronautyki (ISSN 0373-5982), vol. 18, no. 1-2, 1985, p. 57-67. In Polish. refs

The effects of two- and four-hour 5G acceleration on the serum free fatty acids (FFA) in female rats were studied, using gas chromatography for the analyses of fatty acids. The levels of FFA rose after 2 and 4 h acceleration. In the 2 h acceleration group, the percentage of linoleic acid decreased, while that of the arachidonic acid increased. In the 4 h group, on the other hand, significant increases of myristic and linolenic acids were recorded. The observed changes in the levels of serum FFA and in the percent composition of the individual FFA may be detrimental for the organism, and may promote the appearance of lipid disorders. I.S.

N85-34485# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
RESOURCE EVALUATION AND SITE SELECTION FOR MICROALGAE PRODUCTION SYSTEMS
E. L. MAXWELL, A. G. FOLGER, and S. E. HOGG May 1985 98 p refs
(Contract DE-AC02-83CH-10093)
(DE85-008807; SERI/TR-215-2484) Avail: NTIS HC A05/MF A01

Climate, land, and water resource requirements of microalgae production systems (MPS) were examined relative to construction costs, operating costs, and biomass productivity. The objective was the stratification of the southwestern United States into zones of relative suitability for MPS. Maps of climate (insolation, freeze free period, precipitation, evaporation, thunderstorm days), land (use/cover, ownership, slope), and water (saline groundwater) resource parameters were obtained. These maps were transformed into digital overlays permitting the cell by cell compositing of selected resource parameters to form maps representing relative productivity, make up water, climate suitability, land suitability, water suitability, and overall suitability. The Southwest was selected for this study because of its high levels of insolation, saline water resources, and large areas of relatively low valued land. The stratification maps cannot be used for the selection of specific sites because of their low resolution (12,455 acre cells). DOE

N85-34486# Brookhaven National Lab., Upton, N. Y.
ANAEROBIC MICROBIAL TRANSFORMATIONS IN SUBSURFACE ENVIRONMENTS: PROJECT DESCRIPTION
A. J. FRANCIS Apr. 1985 39 p
(Contract DE-AC02-76CH-00016)
(DE85-012789; DOE/CH-00016/T6) Avail: NTIS HC A03/MF A01

Both laboratory and field investigations were conducted to understand the basic biochemical processes involved in the anaerobic transformation of trace metals and selected organic compounds. Controlled laboratory experiments consist of dissolution of trace metals such as As, Cd, Cr, Hg, Mn, Ni, and Pb from model substrate. The effects of the environmental variables such as temperature, pH, O2 tension, moisture, carbon, nitrogen and alternate electron acceptors that may accelerate or reduce biochemical processes in subsurface environments are being investigated. In concert with laboratory research, field studies in the Appalachian region consist of water leachate and soil/waste core sample collection, and physical, chemical and biological characterizations to develop an improved understanding of anaerobic microbial processes. Laboratory observations and processes will be verified and experimental designs will be modified, using information obtained under actual field conditions. The results generated from this basic scientific study will increase our understanding of the biochemical transformations of toxic substances in subsurface environments. DOE

N85-34487# Edgerton, Germeshausen and Grier, Inc., Goleta, Calif.
THE 1984 BIOTIC STUDIES OF YUCCA MOUNTAIN, NEVADA TEST SITE, NYE COUNTY, NEVADA
E. COLLINS and T. P. OFARRELL Feb. 1985 35 p refs
(Contract DE-AC08-83NV-10282)
(DE85-011715; EGG-10282-2057) Avail: NTIS HC A03/MF A01

A portion of Yucca Mountain on and adjacent to the US Department of Energy's Nevada Test Site, Nye County, Nevada, is considered as a possible location for radioactive waste repository. The geologic and environmental characteristics of the site are investigated to determine suitability. Goals of biotic studies are to identify species of concern, describe major floral and faunal associations, determine exposure levels of external background radiation, and assess possible impacts. The species composition of dominant small mammals inhabiting major vegetation associations in 1984 varied little compared with results of similar surveys conducted in 1982 and 1983. Total captures were lower and reproduction was apparently curtailed. Merriam's kangaroo rat and the long tailed pocket mouse continued to be the most abundant species. The composition and relative abundance of associated species was more variable. Western harvest mice were trapped for the first time, but pinyon mice, which were present in prior years, were not trapped. Five desert tortoises were observed during surveys of possible sites for repository surface facilities. DOE

N85-34488# Alabama A & M Univ., Normal.
SCREENING AND CHARACTERIZING OLEAGINOUS MICROALGAL SPECIES FROM THE SOUTHEASTERN UNITED STATES Final Subcontract Report
M. G. TADROS Mar. 1985 37 p refs
(Contract DE-AC02-83CH-10093)
(DE85-008787; SERI/STR-231-2657) Avail: NTIS HC A03/MF A01

Promising algal species which tolerate high light intensities, temperature variations and accumulate lipids were selected and characterized. Samples were collected from freshwater and saltwater locations in the State of Alabama and intertidal regions of the Gulf of Mexico. Samples were screened through a multi-step process. Selected species: Cyclotella, Nitzschia, Chlorella, Scenedesmus and Ankistrodesmus, were examined for growth requirements. Approximate cellular composition of these species was determined. Over sixty strains were isolated, and of these six were ranked as good growers. Two diatoms were isolated that are of particular interest because of their ability to accumulate high lipids. Cyclotella tolerates high temperatures (30 C to 35 C), grows at moderate salinities (15 to 25 parts per thousand), and with nitrogen stress accumulates 42% of its dry weight as lipid. Hantzschia is a large diatom that also grows well at elevated temperatures and full strength seawater. Hantzschia can accumulate as much as 66% of its dry weight as lipid. DOE

N85-34489# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES
20 Aug. 1985 89 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UBB-85-021) Avail: NTIS HC A05/MF A01

Advances on life science, biomedical, and behavioral sciences research in the U.S.S.R. are reported. Topics discussed include: aerospace medicine, biochemistry, bionics, biophysics, biotechnology, epidemiology, food technology, genetics, laser effects, microbiology, molecular biology, nonionizing electromagnetic radiation effects, pharmacology, physiology, and veterinary medicine.

N85-34490# Joint Publications Research Service, Arlington, Va.
MICROORGANISMS IN SPACE FLIGHT Abstract Only
K. M. SYTNIK, ed. *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-021) p 30-31 20 Aug. 1985 Transl. into ENGLISH from Mikrobiol. (Moscow), v. 54, no. 1, Jan. - Feb. 1985 p 169-172
Avail: NTIS HC A08/MF A01

The results of experiments involving developing cultures yielding new information on the influence of extremal factors on living cells are development of space microbiology; (2) specifics of preparation and performance of experiments in space microbiology; (3) influence of space flight factors on the growth, development and mobility of P. vulgaris; (4) ultra structural organization of cells as an indicator of the influence of space flight factors on living systems; (5) ultra structure of proteus vulgaris cells with various methods of cultivation under space flight conditions; (6) microbiological study of various strains of chlorella grown under space flight conditions; (7) ultra structure of chlorella cells grown under space flight conditions; and (8) basics of restructuring of eukaryotic cell in space flight. Author

N85-34505# Joint Publications Research Service, Arlington, Va.
EFFECT OF SEEDS OF HEAVY CHARGED PARTICLES OF GALACTIC COSMIC RADIATION
Y. N. MAKSIMOVA *In its* USSR Rept.: Space Biol. and Aerospace Med. (JPRS-USB-85-005) p 103-107 14 Aug. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biol. i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 3, May - Jun. 1985 p 71-74
Avail: NTIS HC A08

The experiments were carried out on Lactuca sativa seeds exposed for 20, 66, 123 and 308 days in a biostack also containing physical detectors of heavy charged particles. The yield of aberrant cells and its dependence on the exposure time and the site where particles hit the object were measured. The cytogenetic examination demonstrated a significant difference between the seeds that were or were not hit by heavy charged particles. A significant contribution of galactic cosmic radiation to the radiobiological effect is indicated. The yield of aberrant cells as a function of the localization of heavy charged particles in the seed is established. The most sensitive target is the root meristem. E.A.K.

N85-35578*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NASA DEVELOPMENTAL BIOLOGY WORKSHOP: A SUMMARY
K. A. SOUZA, ed. and T. W. HALSTEAD, ed. (NASA, Washington) Sep. 1985 94 p refs Workshop held in Arlington, Va., 2-4 May 1984
(NASA-TM-86756; REPT-85264; NAS 1.15:86756) Avail: NTIS HC A05/MF A01 CSCL 06C

The Life Sciences Division of the National Aeronautics and Space Administration (NASA) as part of its continuing assessment of its research program, convened a workshop on Developmental Biology to determine whether there are important scientific studies in this area which warrant continued or expanded NASA support. The workshop consisted of six panels, each of which focused on a single major phylogenetic group. The objectives of each panel were to determine whether gravity plays a role in the ontogeny of their subject group, to determine whether the microgravity of spaceflight can be used to help understand fundamental problems in developmental biology, to develop the rationale and hypotheses for conducting NASA-relevant research in development biology both on the ground and in space, and to identify any unique equipment and facilities that would be required to support both ground-based and spaceflight experiments.

N85-35579*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EFFECTS OF MICROGRAVITY AND HYPERGRAVITY ON INVERTEBRATE DEVELOPMENT
J. MIQUEL *In its* NASA Develop. Biol. Workshop p 7-34 Sep. 1985 refs
Avail: NTIS HC A05/MF A01 CSCL 06C

Data suggest that abnormal gravity loads do not increase the rate of mutations in lower animals. Insects such as Drosophila melanogaster and Tribolium confusum have been able to reproduce aboard unmanned and manned space satellites, though no precise quantitative data have been obtained on mating competence and various aspects of development. Research with Drosophila flown on Cosmos spacecraft suggests that flight behavior is seriously disturbed in insects exposed to microgravity, which is reflected in increased oxygen utilization and concomitant life shortening. The decrease in longevity was less striking when the flies were enclosed in space, which suggests that they could adapt to the altered gravitational environment when maturation of flight behavior took place in microgravity. The reviewed data suggest that further research on the development of invertebrates in space is in order for clarification of the metabolic and behavioral effects of microgravity and of the development and function of the orientation and gravity sensing mechanisms of lower animals. Author

N85-35580*# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Anatomy.
VERTEBRATE DEVELOPMENT IN SPACE: GRAVITY IS A DRAG (AND HAS BEEN FOR EONS AND EONS)
J. R. KEEFE *In* NASA. Ames Research Center NASA Develop. Biol. Workshop p 35-43 Sep. 1985 refs
Avail: NTIS HC A05/MF A01 CSCL 06C

Brief sketches of developmental biology studies during spaceflight presented are intended to be complete in scope and to provide the reader with an overview of the present status of such studies. Means of evaluating both the direct role of gravity on all processes of mammalian reproduction and development as well as defining the means of assessing indirect transplacemental aspects are considered. The potential present in the development of a spaceflight system/program specifically designed to provide chronic exposure of a representative variety of mammalian species with periodic sampling for multiple generations to fully assess the potential impact of an altered gravitational vector on general mammalian development is also considered. E.R.

N85-35581*# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Anatomy.
REPORT OF THE NASA MAMMALIAN DEVELOPMENTAL BIOLOGY WORKING GROUP
J. R. KEEFE *In* NASA. Ames Research Center NASA Develop. Biol. Workshop p 45-63 Sep. 1985 refs
Avail: NTIS HC A05/MF A01 CSCL 06C

Development is considered to encompass all aspects of the mammalian life span from initial initial germ cell production through the complete life cycle to death of the organism. Thus, gamete production, fertilization, embryogenesis, implantation, fetogenesis, birth, peri- and postnatal maturation, and aging were all considered as stages of a development continuum relevant to problems of Space Biology. Deliberations thus far have been limited to stages of the development cycle from fertilization to early postnatal life. The deliberations are detailed. E.R.

N85-35582*# Wisconsin Univ., Madison. Dept. of Anatomy.
REPORT OF THE AVIAN DEVELOPMENT WORKING GROUP
J. F. FALLON *In* NASA. Ames Research Center NASA Develop. Biol. Workshop p 65-68 Sep. 1985
Avail: NTIS HC A05/MF A01 CSCL 06C

The anteroposterior axis of the avian embryo is established before it is laid. Baer's rule states that the cephalic end of the avian embryo will be away from the observer when the pointed end of the shell is on the observer's right. There are experimental data available which indicate gravity has a role in the establishment of the anteroposterior axis while the egg is in the uterus; this

results in Baer's rule. The influence of gravity on egg development is studied. Author

N85-35583*# Indiana Univ., Bloomington. Dept. of Biology.
REPORT OF AMPHIBIAN DEVELOPMENT GROUP
G. MALACINSKI *In* NASA. Ames Research Center NASA Develop. Biol. Workshop p 69-73 Sep. 1985 refs
Avail: NTIS HC A05/MF A01 CSCL 06C

Amphibian and fish embryos are extremely well suited for studies on pattern specification, whereas other systems (e.g., avian or mammalian) might be just as well suited for studies on differentiation or growth. Those distinctions are important for at least two reasons: (1) More precise focus regarding underlying mechanisms is called for when those distinctions are made. That facilitates the formulation of specific models or hypotheses; and (2) stress effects (i.e., the effects of weightlessness on structures (e.g., bones) which normally bear a load) are distinguished as being indirect, in contrast to direct effects of microgravity, which would be expected to act on pattern specification. That is, direct gravity effects are distinguished from indirect stress effects. Author

N85-35584*# Rockstein (Morris), Coral Gables, Fla.
REPORT OF THE INSECT DEVELOPMENT GROUP
M. ROCKSTEIN *In* NASA. Ames Research Center NASA Develop. Biol. Workshop p 75-77 Sep. 1985
Avail: NTIS HC A05/MF A01 CSCL 06C

Drosophila metanogaster was chosen as the insect species of choice, in regard to gravity response experiments involving normal reproduction and develop different strains. The specific gravity responses which might be affected by microgravity and are exhibited in normal reproduction and development include normal flight for courtship, mating and oviposition, tropisms for pupating or emergency of the adult, and crawling for gettering food by the larval instars at the organismic level. At the suborganismic elevel, it is believed that maturation of developing eggs in the virgin female and embryonic development of the developing egg could be affected by microgravity and warrant study. Author

N85-35585*# Millsaps Coll., Jackson, Miss.
AQUATIC INVERTEBRATE DEVELOPMENT WORKING GROUP
D. MEYERS *In* NASA. Ames Research Center NASA Develop. Biol. Workshop p 79-81 Sep. 1985 refs
Avail: NTIS HC A05/MF A01 CSCL 06C

Little definitive evidence exists to show that gravity plays a major role in embyrogenesis of aquatic invertebrates. Two reasons for this may be: (1) few studies have been done that emphasize the role of gravity; and (2) there simply may not be any gravity effect. The buoyant nature of the aquatic environment could have obscured any evolutionary effect of gravity. The small size of most eggs and their apparent lack of orientation suggests reduced gravitational influence. Therefore, it is recommended that the term development, as applied to aquatic invertebrates, be loosely defined to encompass behavioral and morphological parameters for which baseline data already exist. Author

N85-35586*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
REPORT OF THE MICROBIAL DEVELOPMENT WORKING GROUP
G. NELSON *In* NASA. Ames Research Center NASA Develop. Biol. Workshop p 83-89 Sep. 1985 refs
Avail: NTIS HC A05/MF A01 CSCL 06C

In formulating ideas on the relationship of gravity to the development, growth, and reproduction of microorganisms, a rather liberal definition of microorganisms is used which includes bacteria, yeasts, protists, filamentous fungi, and single cells in culture. A principal advantage of microorganisms as experimental subjects is the rigor with which they can be defined and controlled. As single cells, each cell may be regarded as identical to the others in the population. This property applies to the morphology, physiology, and genetic parameters of the cells. The growth and development of the population is subject to precise manipulation as the nutritional requirements are known and minimal media formulations have been developed. Growth and differentiation can be manipulated in a variety of ways, such as alteration of the culture temperature and food supply, or by use of mutants. Finally, the short generation times of microorganisms provide the opportunity to conduct multigenerational studies within practical time limits and, in a similar vein, cellular responses to various stimuli or stresses are conveniently monitored because of the rapid response times of single cells. Author

N85-35587# Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Atmospheric Research.
THE MEASUREMENT OF NITROGEN OXIDE (NO, NO2) EXCHANGE OVER PLANT/SOIL SURFACES
I. E. GALBALLY, C. R. ROY (Australian Radiation Lab.), C. M. ELSWORTH, and H. A. RABICH 1985 26 p refs Document includes Microfiche supplement
(CSIRO-DAR-TP-8; ISBN-0-643-03867-1) Avail: NTIS HC E03/MF A01

A chamber technique for evaluating fluxes of NO and NOX (NO + NO2) over soil/plant surfaces is described. A mathematical model involving a constant exhalation rate of NO from the soil/plant surface coupled with a competing concentration dependent uptake process is formulated. This model provides a good fit to the data obtained from chamber measurements and allows the quantitative determination of both net and gross NO and NOX fluxes over the plant/soil surfaces examined. Measurements of these fluxes and supporting data from a grazed pasture at the Agricultural Research Center, Victoria during 2 weeks in April 1978 are presented. Author

N85-35588*# Arizona Univ., Tucson. Dept. of Biochemistry.
POSSIBLE MECHANISM FOR CHANGES IN GLYCOGEN METABOLISM IN UNLOADED SOLEUS MUSCLE
E. J. HENRIKSEN and M. E. TISCHLER 1985 2 p
(Contract NAGW-227)
(NASA-CR-176184; NAS 1.26:176184) Avail: NTIS HC A02/MF A01 CSCL 06C

Carbohydrate metabolism has been shown to be affected in a number of ways by different models of hypokinesia. In vivo glycogen levels in the soleus muslce are known to be increased by short-term denervation and harness suspension. In addition, exposure to 7 days of hypogravity also caused a dramatic increase in glycogen concentration in this muscle. The biochemical alterations caused by unloading that may bring about these increases in glycogen storage in the soleus were sought. G.L.C.

N85-35589*# Arizona Univ., Tucson. Dept. of Biochemistry.
RESPONSE OF AMINO ACIDS IN HINDLIMB MUSCLES TO RECOVERY FROM HYPOGRAVITY AND UNLOADING BY TAIL-CAST SUSPENSION
M. E. TISCHLER, E. J. HENRIKSEN, S. JACOB, and P. H. COOK 1985 2 p refs
(Contract NAGW-227)
(NASA-CR-176183; NAS 1.26:176183) Avail: NTIS HC A02/MF A01 CSCL 06C

Concentrations of glutamine, glutamate, aspartate (+ asparagine) and alanine were compared in hindlimb muscles of SL-3 and ground control rats. Alanine was lower in the soleus of flown rats but not of suspended animals, with no response in other muscles except a slight increase in the unloaded plantaris. With recovery, alanine in the soleus was elevated. Since no differences in alanine metabolism were found by isolated muscle, changes in muscle alanine are probably due to altered body use of this amino acid leading to varied plasma levels. G.L.C.

N85-35590*# Arizona Univ., Tucson. Dept. of Biochemistry.
RESPONSE OF RAT HINDLIMB MUSCLES TO 12 HOURS RECOVERY FROM TAIL-CAST SUSPENSION
M. E. TISCHLER, E. J. HENRIKSEN, S. JACOB, and S. R. JASPERS 1985 2 p refs
(Contract NAGW-227)
(NASA-CR-176182; NAS 1.26:176182) Avail: NTIS HC A02/MF A01 CSCL 06C

Previous work has shown a number of biochemical changes which accompany atrophy or reduced muscle growth in hindlimb of tail-casted, suspended rats. These results clearly show that altered muscle growth was due to changes in protein turnover. Accordingly, the rise in soleus tyrosine following unloading reflects the more negative protein balance. Other major changes we found included slower synthesis of glutamine as indicated by lower ratios of glutamine/glutamate and reduced levels of aspartate which coincide with slower aspartate and ammonia metabolism in vitro. In conjunction with the study of SL-3 rats, which were subjected to 12 h of post-flight gravity, a study of the effects of 12 h eight bearing on metabolism of 6-day unloaded hindlimb muscles was carried out. G.L.C.

N85-35591*# Arizona Univ., Tucson. Dept. of Biochemistry.
MUSCLE PROTEIN AND GLYCOGEN RESPONSES TO RECOVERY FROM HYPOGRAVITY AND UNLOADING BY TAIL-CAST SUSPENSION
E. J. HENRIKSEN, M. E. TISCHLER, S. JACOB, and P. H. COOK 1985 2 p refs
(Contract NAGW-227)
(NASA-CR-176181; NAS 1.26:176181) Avail: NTIS HC A02/MF A01 CSCL 06C

Previous studies in this laboratory using the tail-bast hindlimb suspension model have shown that there are specific changes in protein and carbohydrate metabolism in the soleus muscle due to unloading. For example, 6 days of unloading caused a 27% decrease in mass and a 60% increase in glycogen content in the soleus muscle, while the extensor digitorum longus muscle was unaffected. Also, fresh tissue tyrosine and its in vitro release from the muscle are increased in the unloaded soleus, indicating that this condition causes a more negative protein balance. With these results in mind, studies to investigate the effect of hypogravity on protein and carbohydrate metabolism in a number of rat hindlimb muscles were carried out. G.L.C.

N85-35592# Systems and Applied Sciences Corp., Hyattsville, Md.
LITERATURE SEARCH FOR NEW PHYSICAL METHODS FOR BIOLOGICAL AEROSOL DETECTION Contractor Report, Aug. 1982 - Sep. 1984
L. SHAPIRO Apr. 1985 216 p
(Contract DAAK11-82-C-0113)
(AD-A155883; CRDC-CR-84132) Avail: NTIS HC A10/MF A01 CSCL 06M

Microbiological entities in the atmosphere can be viewed as particles and studied for their particle properties, as packages of chemicals such as proteins, glucosides, DNA or RNA carriers, as potentially fluorescent or stainable entities or are as viable cells capable of reaction with an environment to produce detectable products. This report presents a discussion of each of the techniques found suitable to deal with some aspect of detection. In addition, a brief presentation is made of experimental probes of two unique approaches made within the time frame of the project. The final section presents the bibliography developed in the study. The reference material presented are those actually looked at and almost all were photocopied for convenient review. In each category they are arranged chronologically, the most recent first. GRA

N85-35593# Chicago Univ., Ill.
MOLECULAR BIOLOGY OF ENVIRONMENTAL AROMATIC HYDROCARBONS Progress Report, 1 Sep. 1984 - 31 Jun. 1985
S. B. WEISS Jul. 1985 13 p refs
(Contract DE-AC02-80EV-10328)
(DE85-015036; DOE/EV-10328/4) Avail: NTIS HC A02/MF A01

The biological activities of the (+)- and (-)-enantiomers of anti-BPDE (benzoapyrene diol epoxide) and BePe (benzoepyrene epoxide) were examined for their capacity to inhibit infectious single- and double-stranded 0X174 phage DNAs. For both activated PAH derivatives, the (+)-isomer was more inhibitory using either single- or double-stranded 0X DNAs. Both PAH derivatives showed a higher inhibition potency with single-strended 0X DNA than with duplex DNA; this difference between the two phage DNA forms was much greater for BePe than with anti-BPDE. A model viral DNA system was used, containing short oligonucleotide inserts as targets for PAH alkylation, to detect sequence modifications induced by anti-BPDE. A 10-base-pair oligomer (Bam HI linker) was treated with anti-BPDE and inserted into phage M13 replicative from DNA. E. coli was transfected with the recombinant DNA containing the alkylated oligomer, progeny viral plaques were selected, and their DNAs subjected to DNA sequence analysis at the region of oligomer insertion. For the alkylated inserts used in our study, the DNA sequence analysis of progeny viral DNA showed that nucleotide deletions were present in all the clones examined. DOE

N85-35602# European Space Agency, Paris (France).
ARE LIVING CELLS GENERALLY SENSITIVE TO GRAVITY?
W. BRIEGLEB *In its* Proc. of a Sci. Meeting on the Occasion of the Inauguration of New Buildings for the DFVLR Inst. for Aerospace Med. (DFVLR-Mitt-83-19) p 92-105 Nov. 1984 refs Transl. into ENGLISH from "Vortraege eines flugmed. Kolloq. aus Anlass der Vorstellung des Naubaues des DFVLR-inst. fuer Flugmed." rept. DFVLR-Mitt-83-19 DFVLR, Cologne, 1983 p 87-97 Original language document was announced as N84-27425
Avail: NTIS HC A07/MF A01; original German version available from DFVLR, Cologne DM 43

General sensitivity of living cells to gravity is discussed. Categories of specific sensory functions for the individual cells of multicellular organisms are described. Overall regulation of metabolism, differentiation, and transport processes in cells; toxic sensory functions of cells moving autonomously during differentiation of embryos and organs, in regenerating tissue, and in blood cells and sperm; and polarization processes due to external stimuli during maturation and fertilization of ova and the early stages of segmentation in animals and plants are discussed. If the three categories are subject to direct gravitational influence, then they would all have a hypothetical primary gravitation receptor located in the smallest functional unit, i.e., the cell. Ground based and spaceborne results about general gravity sensitivity are inconclusive. Author (ESA)

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

A85-47191#
CARDIOVASCULAR CHANGES WITH HEAD-DOWN ANKLE SUSPENSION
D. CARDUS, W. G. MCTAGGART, and E. DOMINGO (Baylor College of Medicine, Houston, TX) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-45, S-46. refs

The effects of head-down inversion on the central and the peripheral circulation were studied in healthy men, aged 21-30 years. Changes in blood flow, measured by electric impedance changes, and in blood pressure, measured noninvasively, were assessed at three phases: vertical head-up, horizontal supine, and vertical head-down, each lasting 5 min. In relation to the standing position, the head-down suspension resulted in a nonsignificant lowering of the heart rate; a significant increase in mean blood pressure in the arms; increases in the stroke volume and cardiac output, which became the same as in the horizontal position; and a decrease in leg blood pressure. In assuming the head-down position, there was a shift of fluids from the legs to the thorax, and a decrease in the peripheral vascular resistance in the lower extremities. The findings of these and previous studies are consistent with the interpretation of undue stress in the cephalad portion of the body, which is a potential risk for those practicing head-down suspension. I.S.

A85-47193#
PLASMA RENIN ACTIVITY DURING 5-HOUR ANTIORTHOSTATIC HYPODYNAMIA
G. ANNAT, G. GAUQUELIN, G. GEELEN, C. GHARIB (Lyon I, Universite, Lyon, France), A. GUELL (Centre Hospitalier Regional Ranguell, Toulouse, France) et al. (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-49, S-50. Research supported by the Universite Lyon I, CNES, and DRET. refs

This study was designed to investigate the renin secretion in the course of a head-down bed rest, which is considered a reliable model for ground-based weightlessness simulation. Serial measurements of plasma renin activity (PRA) were realized in six adult volunteers submitted to the three following postural tests. Day 1: 7 hours sitting. Day 2: 1 hour sitting; then 5 hours horizontal supine, finally 1 hour sitting. Day 3: 1 hour sitting, then 5 hours head-down bed rest (-10 deg), finally 1 hour sitting. The order of the postural tests was randomized for each subject. The results show that a 5-hour head-down tilt results in a progressive decline of PRA. This decline occurs earlier, and is more pronounced than the one observed during horizontal bed rest. The kinetics of the renin response to a 5-hour head-down bed rest is similar to that observed during a head-out water immersion of the same duration. Author

A85-47194*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ROLE OF CARDIAC VOLUME RECEPTORS IN THE CONTROL OF ADH RELEASE DURING ACUTE SIMULATED WEIGHTLESSNESS IN MAN
V. A. CONVERTINO, B. A. BENJAMIN, L. C. KEIL, and H. SANDLER (NASA, Ames Research Center, Moffett Field, CA; Arizona, University, Tucson) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-51, S-52. refs

Hemodynamic responses and antidiuretic hormone (ADH) were measured during body position changes, designed to induce central blood volume shifts in ten cardiac and one heart-lung transplant recipients, to assess the contribution of cardiac volume receptors in the control of ADH release during the initial acute phase of exposure to weightlessness. Each subject underwent 15 min of a sitting-control period (C) followed by 30 min of 6 deg headdown tilt (T) and 30 min of resumed sitting (S). Venous blood samples and cardiac dimensions were taken at 0 and 15 min of C; 5, 15, and 30 min of T; and 5, 15, and 30 min of S. Blood samples were analyzed for hematocrit, plasma osmolality, plasma renin activity (PRA), and ADH. Heart rate and blood pressure were recorded every two min. Plasma osmolality was not altered by posture changes. Mean left ventricular end-diastolic volume increased (P less than 0.05) from 90 ml in C to 106 ml in T and returned to 87 ml in S. Plasma ADH was reduced by 20 percent (P less than 0.05) with T, and returned to control levels with S. These responses were similar in six normal cardiac-innervated control subjects. These data may suggest that cardiac volume receptors are not the primary mechanism for the control of ADH release during acute central volume shifts in man. Author

A85-47195#
CARDIOVASCULAR RESPONSES TO +G OR -G STIMULATED DURING POST-EXERCISE IN MILD SUPINE PEDALLING IN -60 MM HG LBNP
S. TORIKOSHI, K. YOKOZAWA, J. NAGANO, Y. FUKASE, K. ITO (Women's Christian University, Tokyo, Japan) et al. (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-53, S-54.

A85-47196#
BLOOD PRESSURE RELATED WITH MUSCLE ACTIVITY AND/OR CAROTID ARTERY COMPRESSURE DURING MILD SUPINE EXERCISE EXPOSED TO LBNP
Y. SUZUKI, J. NAGANO, Y. FUKASE, K. ITO, K. YOKOZAWA (Tokyo Academy for Wellness Science, Japan) et al. (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-55, S-56.

A85-47197#
NON-INVASIVE ASSESSMENT OF HEART CONTRACTILITY CHANGES DURING A 7 DAY 6 DEG HDT 0-G SIMULATION
L. BECK and F. BAISCH (DFVLR, Institut fuer Flugmedizin, Cologne, West Germany) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-57, S-58. refs

The effect of zero gravity simulated by 6-deg head-down tilt (HDT) on heart contractility was investigated. To obtain ventricular function curves, venous return to the heart (preload) was varied by application of the lower body negative pressure device. Two systolic time intervals were used as parameters of the ventricular function: the pre-ejection period (PEP) and the left ventricular ejection time (LVET). The PEP and LVET values were plotted as a function of a decreasing suction in mm Hg (preload). At the

end of the HDT period, the PEP vs preload curves were shifted upward, while the LVET curves shifted downward in comparison with controls, indicating a change of the contractile state. There were no significant changes of arterial pressure during HDT. Thus, a depression of the contractile state of the heart is a part of the mechanisms involved in the cardiovascular adaptation to simulated zero gravity. I.S.

A85-47198#
PHYSICAL FITNESS AND ITS EFFECT ON FACTORS AFFECTING ORTHOSTATIC TOLERANCE
P. B. RAVEN and M. L. SMITH (Texas College of Osteopathic Medicine, Forth Worth) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-59, S-60. refs

A85-47199#
EFFECT OF DIFFERENT RESTING POSITION ON URINARY KALLIKREIN ACTIVITY IN NORMAL MAN
J. L. BASCANDS, J. P. GIROLAMI, J. M. SUC (Toulouse III, Universite, France), G. GAUQUELIN, G. ANAT (Lyon I, Universite, France) et al. (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-61, S-62. refs

The effect of changes in the body position on the variations of the renal kallikrein kinin system (RKKS) was studied to establish a reference position for the baseline values. Three experimental protocols were used: day 1, sitting for seven hours; day 2, 1 h sitting (control period), followed by 5 h in supine position, and by 1 h sitting (recovery period); day 3, 1 h sitting, 5 h in head-down tilt (HDT) at -8 deg, 1 h sitting. Hourly urine samples were analyzed for kallikrein activity by radioimmunoassaying the generated bradykinin. Whereas no changes in diuresis and in kallikrein activity were observed in day 1, the changes in position to supine or HDT postures resulted in significant stimulation of kallikrein excretion. The elevated experimental kallikrein values returned to control levels after 1 h of recovery in the sitting position. Thus, the sitting position appears to be suitable for determination of baseline values in the RKKS studies. I.S.

A85-47200#
EFFECT OF MUSCULAR EXERCISE DURING 4 DAYS SIMULATED WEIGHTLESSNESS ON ORTHOSTATIC TOLERANCE
J. L. BASCANDS, A. GUELL (Centre Hospitalier Universitaire Rangueil, Toulouse, France), G. GAUQUELIN, G. ANNAT, J. P. PEQUIGNOT (Lyon I, Universite, France) et al. (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-63, S-64. refs

In this study, the effectiveness of muscular exercise to prevent orthostatic intolerance (OI), was investigated during a 4-days head-down tilt (HDT) at -6 deg in two groups of four young males, one control and one submitted twice a day to one hour of bicycle exercise. To evaluate orthostatic tolerance, two tilt tests were performed, one before the HDT, and one after the HDT. Plasma renin activity (PRA), plasma arginine vasopressin, and plasma catecholamines were measured. Heart rate (HR) and blood pressure (BP) were recorded every minute all through the test. In both groups, the two tilt tests produced an increase in HR. After the HDT, the tilting at +85 deg induced an increase in PRA in both groups, but no difference was observed between the two groups. During the second tilt test, OI was only demonstrated by the exercise groups. These results suggest that under present experimental conditions, physical exercise is ineffective to prevent OI. Author

A85-47201#
PLASMA CATECHOLAMINES AND CENTRAL HEMODYNAMICS DURING SIMULATED ZERO GRAVITY (HEAD OUT WATER IMMERSION) IN HUMANS
F. BONDE-PETERSEN, P. NORSK, and N. J. CHRISTENSEN (Copenhagen, University; County Hospital, Herlev, Denmark) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-65, S-66. Sponsorship: Danish Space Board. refs
(Contract DSB-1112-32/83; DSB-1112-33/83)

The variation in plasma epinephrine (PIE) and norepinephrine (PINE) with increased central venous pressure (CVP) was examined in eight healthy males on two occasions after overnight food and fluid restriction. During control the subjects sat upright outside the pool for 6 hours wearing a water-perfused garment (water temperature = 34.6 C. During water immersion to the neck (WI) they assumed the same position in a stirred water bath for 6 hours (water temperature = 35.0 C). Central venous pressure, systolic arterial pressure, and cardiac output increased during water immersion as compared to control, while diastolic arterial pressure was unchanged. Heart rate (HR) was decreased by 10 bpm throughout immersion. When PIE and PINE during WI were compared to control values, significant decreases were found. The experiment indicates that the decrease in HR is controlled by sympathetic nervous activity which is diminished during WI. Author

A85-47202#
CENTRAL VENOUS PRESSURE AND PLASMA ARGININE VASOPRESSIN DURING WATER IMMERSION COMBINED WITH INFUSION AND HEMMORRHAGE IN MAN
P. NORSK, F. BONDE-PETERSEN, and J. WARBERG (Copenhagen, University, Denmark) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-67, S-68. Sponsorship: Danish Space Board. refs
(Contract DSB-1112-32/83; DSB-1112-33/83)

A85-47203#
PLASMA NOREPINEPHRINE RESPONSES TO STIMULATION OF COLD RECEPTORS AND VOLUME RECEPTORS
D. R. KNIGHT, F. V. SETARO, and S. M. HORVATH (California, University, Santa Barbara) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-69, S-70.

If plasma concentrations of norepinephrine (NE)p are lowered by expansion of the intrathoracic blood volume and raised by cooling of the body, then intrathoracic volume receptors may limit the rise of plasma norepinephrine concentration (NE)p during cold-water immersion. Six healthy men were exposed to a control condition (27.6 C air), thermoneutral water (35 C), cold air (14.8 C), and cold water (29.8 C). Immersion in thermoneutral water reduced (NE)p from 0.34 ng/ml to 0.20 ng/ml. Mean (NE)p increased to peak values of 1.5 ng/ml in cold air and 1.1 ng/ml in cold water, with no significant differences being observed between the (NE)p's in cold air and cold water. Despite an apparent expansion of intrathoracic blood volume, immersion in cold water did not significantly reduce (NE)p below values measured in cold air. Therefore, volume receptors did not limit the increase of (NE)p in response to cold stress during cold-water immersion. Author

A85-47220#
SOME PHYSIOLOGICAL CONSEQUENCES OF G-INDUCED BODY FLUID SHIFTS AND MUSCLE LOAD REDUCTION
F. BAISCH and K. E. KLEIN (DFVLR, Institut fuer Flugmedizin, Cologne, West Germany) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-103 to S-106. refs

Actual or simulated microgravity produce cephalic congestion, changes in the low pressure system, and extra/intracellular electrolyte shifts. Taking this into account, it is possible to overcome the major drawbacks of the fluid shift theory to explain some physiological consequences of adaptation to microgravity. Based on the results of 0-g simulations and those obtained during space flight the following mechanisms are considered: (1) The cephalic fluid shift influences central neuronal processes. Changes of cerebral reflex loops as well as an increase of the parasympathetic tone were observed; (2) Reduction of left ventricular dimensions has been observed during 0-g simulations and after space flights. During the remobilization phase of 0-g simulations, an increase of left ventricular dimensions above control was observed, provided that total blood volume had been reestablished. This indicates cardiac deconditioning; (3) Besides muscular disuse, the intracellular fluid and electrolyte shift offers an additional explanation of the imbalance between blood glucose and insulin; (4) As a result of sustained reduced loading of the vascular walls in 0-g, textural changes in the vascular walls are likely to occur. Author

A85-48087
ACTIVE AND PASSIVE SMOOTH EYE MOVEMENTS - EFFECTS OF STIMULUS SIZE AND LOCATION
J. POLA and H. J. WYATT (New York, State University, NY) Vision Research (ISSN 0042-6989), vol. 25, no. 8, 1985, p. 1063-1076. Research supported by the State University of New York Research Foundation and Optometric Center of New York Foundation. refs
(Contract NIH-EY-02878)

Experiments were conducted to measure the effects of target position and velocity on active and passive smooth eye movements. The subjects viewed the stimuli on a rear-projection screen under open-loop conditions. The tests revealed that active movement occurs with foveal stimuli, has a high amplitude, and a large phase lag. Passive movement occurs with either foveal or eccentric stimuli, has a low amplitude, and a small phase lag. The passive movements were similar to optokinetic eye movements. Both active and passive movements displayed an increase in amplitude and phase lag when the target size was increased. The results showed that active eye movement was voluntary and stimulated by target location and velocity; passive eye movement was reflexive and stimulated by target velocity. Active response to velocity was related to passive response and thereby optokinesis. Active and passive smooth eye movements are triggered by similar oculomotor mechanisms. The relevance of the results to the study of optokinetic nystagmus is discussed. I.F.

A85-48088
VISUAL CONSPICUITY OF A MOVING DOT, HORIZONTAL LINE SEGMENT OR VERTICAL LINE SEGMENT
T. MORI (Ministry of International Trade and Industry, Electrotechnical Laboratory, Sakura, Japan) Vision Research (ISSN 0042-6989), vol. 25, no. 8, 1985, p. 1083-1088. refs

The effect of varying the retinal eccentricity of a moving target on its conspicuity were explored for targets whose shape, orientation, size and luminance were the same as the stationary background elements. The target was a dot, horizontal line segment, or vertical line segment. The main results were: (1) conspicuity increased monotically as a function of velocity for all of the cases: (2) The rate of the increase of conspicuity slowed down at around a velocity between 0.6 and 0.8 deg/sec (break in slope). (3) Author

A85-48424
BIOLOGICAL CLOCKS - NEW DATA CONCERNING THE REGULARITY OF CIRCADIAN CHANGES IN THE STATE OF THE HUMAN ORGANISM [PROBLEMA BIOLOGICHESKIKH CHASOV - NOVYE DANNYE O ZAKONOMERNOSTIAKH SUTOCHNOGO KHODA IZMENENII SOSTOIANIIA ORGANIZMA CHELOVEKA]
L. IA. GLYBIN (Vladivostokskii Meditsinskii Institut, Vladivostok, USSR) Biofizika (ISSN 0006-3029), vol. 30, July-Aug. 1985, p. 717-720. In Russian. refs

Studies of the variations in normal physiological functions of the human organism and of their pathological manifestations are presented. Statistical analyses of the circadian variations in occurrence of such events as child delivery, increased or decreased work efficiency, traumas, various diseases, their complications and fatal outcome, and traffic accidents, averaged for every hour of the 24-hr diurnal periods, revealed the presence of highly reproducible rhythm. The periods, associated with occurrence of high and low physiological tonus (PT), repeated every 4-6 hours. The PT cycles are apparently associated with the progress of the earth's rotation around its axis. They follow local times and are independent of the season and the geographic latitudes. I.S.

A85-48425
SEASONAL VARIATIONS IN THE NUMBERS AND THE ACTIVITY OF THYMUS-DEPENDENT LYMPHOCYTES IN GENERALLY HEALTHY HUMANS OF DIFFERENT AGES [SEZONNYE IZMENENIIA KOLICHESTVA I AKTIVNOSTI TIMUSZAVISIMYKH LIMFOTSITOV U PRAKTICHESKI ZDOROVYKH LITS RAZNOGO VOZRASTA]
G. P. KRAVCHUK (Kievskii Institut Otolaringologii, Kiev, Ukrainian SSR) Fiziologicheskii Zhurnal (Kiev) (ISSN 0201-8489), vol. 31, July-Aug. 1985, p. 491-493. In Russian. refs

A85-49154
EVIDENCE OF CHAOTIC DYNAMICS OF BRAIN ACTIVITY DURING THE SLEEP CYCLE
A. BABLOYANTZ, J. M. SALAZAR (Bruxelles, Universite Libre, Brussels, Belgium), and C. NICOLIS (Institut d'Aeronomie Spatiale de Belgique, Brussels, Belgium) Physics Letters (ISSN 0375-9601), vol. 111A, Sept. 2, 1985, p. 152-156. refs
(Contract EEC-STI-0004-J-C(CD))

A85-49358
EXPERIMENTAL RESULTS IN A PHYSICAL MODEL OF THE COCHLEA
C. CANCELLI, S. DANGELO, M. MASILI (Torino, Politecnico, Turin, Italy), and R. MALVANO (CNR, Centro di Studio per la Dinamica dei Fluidi, Turin, Italy) Journal of Fluid Mechanics (ISSN 0022-1120), vol. 153, April 1985, p. 361-388. CNR-supported research. refs

Physical models have made a contribution to an improved understanding of cochlear mechanics. However, certain difficulties arise in the design of suitable physical models. In the present paper, experimental results obtained with a rectilinear axis, three-chamber model are described. The elements of the cochlear cross section contained in the model include the basilar membrane, Reissner's membrane, the tectorial membrane, and the organ of Corti. Attention is given to the geometric and dynamic similitude in Bekesy's model, an analysis of the dimensionless coefficients of the normalized equations of the flow field in the cochlea, the geometrical similitude, details regarding the considered model, experimental conditions, and experimental results. G.R.

A85-49446
THE PHYSIOLOGICAL PRINCIPLES FOR THE DEVELOPMENT OF WORK-REST REGIMENS [FIZIOLOGICHESKIE PRINTSIPY RASRABOTKI REZHIMOV TRUDA I OTDYKHA]
V. I. MEDVEDEV, ED. Leningrad, Izdatel'stvo Nauka, 1984, 144 p. In Russian. No individual items are abstracted in this volume.

The theoretical problems in the development of work-rest regimens are discussed including mathematical simulations of the regimens, the principles and methods involved in developing model

work-rest regimens for the duration of a work shift, and the schedules of work and rest sequences in a continuous production process. Also discussed are varieties of nonstandard work-rest regimens for professional transport personnel, and the effectiveness of different work-rest regimens on the basis of the results of physiological measurements are presented. I.S.

A85-49690
SPINAL REFLEXES IN MICROGRAVITY - MEASURING H REFLEXES DURING SPACE FLIGHT
D. G. RUEEG (Fribourg, Universite, Switzerland) Science (ISSN 0036-8075), vol. 220, Sept. 27, 1985, p. 1409, Author's Reply, p. 1409. refs

The report by Reschke et al. (1984) on the problem of motor programming in microgravity using Hoffman or H reflex measurements in man during space flights is commented on, and Reschke replies. Before and after the Spacelab 1 flight in question, control changes of the reflexes were measured during falling under the influence of gravity. During the flight, changes were measured during falling induced by rubber bands. The commentary argues that the changes recorded cannot be easily understood since the intensity of the stimuli to evoke the reflexes was not specified and since the changes were extremely high. The answer states that the reported values were not a mistake and explains how they resulted. C.D.

A85-49974* California Univ., Berkeley.
NEUROPHYSIOLOGICAL MODEL OF THE NORMAL AND ABNORMAL HUMAN PUPIL
W. KRENZ, M. ROBIN, S. BAREZ, and L. STARK (California, University, Berkeley) IEEE Transactions on Biomedical Engineering (ISSN 0018-9294), vol. BME-32, Oct. 1985, p. 817-825. refs
(Contract NCC2-86)

Anatomical, experimental, and computer simulation studies were used to determine the structure of the neurophysiological model of the pupil size control system. The computer simulation of this model demonstrates the role played by each of the elements in the neurological pathways influencing the size of the pupil. Simulations of the effect of drugs and common abnormalities in the system help to illustrate the workings of the pathways and processes involved. The simulation program allows the user to select pupil condition (normal or an abnormality), specific site along the neurological pathway (retina, hypothalamus, etc.) drug class input (barbiturate, narcotic, etc.), stimulus/response mode, display mode, stimulus type and input waveform, stimulus or background intensity and frequency, the input and output conditions, and the response at the neuroanatomical site. The model can be used as a teaching aid or as a tool for testing hypotheses regarding the system. I.S.

A85-50052
BITE STRENGTH TESTS OF FLYING PERSONNEL IN A LOW-PRESSURE CHAMBER IN REFERENCE TO THE STOMATOLOGIC TREATMENT OF PILOTS AND ASTRONAUTS [BADANIA SIL NAGRYZU U PERSONELU LATAJACEGO W KOMORZE NISKICH CISNIEN KNC JAKO PRZYCZYNEK DO LECZENIA STOMATOLOGICZNEGO PILOTOW I KOSMONAUTOW]
A. SKRZYPKOWSKI (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland) Postepy Astronautyki (ISSN 0373-5982), vol. 17, no. 3-4, 1984, p. 69-76. In Polish.

A85-50058
HEART RHYTHM DISTURBANCES DURING CENTRIFUGE EXAMINATION AND THEIR EFFECT ON ACCELERATION TOLERANCE [ZABURZENIA RYTMU SERCA PODCZAS BADAN NA WIROWCE PRZECIAZENIOWEJ I ICH WPLYW NA TOLERANCJE PRZYSPIESZEN]
L. KOPKA and J. DOMASZUK Postepy Astronautyki (ISSN 0373-5982), vol. 18, no. 1-2, 1985, p. 69-80. In Polish. refs

Six percent of the pilots whose heart activity was monitored during acceleration tolerance testing disclosed signs of heart rhythm disturbances in their electrocardiograms. The interpretation of these cardiograms, supplemented by special tests, clinical observation, and additional cardiac tests, have disclosed that during the build-up of +Gz acceleration, single premature heart stimulations (ventricular, less frequently supraventricular) are the most typical disturbances. In the deceleration phase, sinus arrhythmia and supraventricular wandering pacemaker were observed. These disturbances are caused mainly by the vegetative system tone changes, and do not significantly affect acceleration tolerance. Subjects with detected additional or massive accessory stimulation require a widened scope of cardiological diagnosis including echocardiographic and electrophysiological tests. I.S.

A85-50059
ORGANIZATION OF HUMAN LIFE IN SPACE FROM THE VIEWPOINT BIORHYTHM SCIENCE [ORGANIZACJA ZYCIA CZLOWIEKA W KOSMOSIE Z PUNKTU WIDZENIA NAUKI O BIORYTMACH]
T. BOSZKIEWICZ (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland) Postepy Astronautyki (ISSN 0373-5982), vol. 18, no. 1-2, 1985, p. 93-102. In Polish. refs

N85-34491* National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 274)
Aug. 1985 53 p
(NASA-SP-7011(274); NAS 1.21:7011(274)) Avail: NTIS HC A04 CSCL 06E

This bibliography lists 128 reports, articles, and other documents introduced into the NASA scientific and technical information system in July 1985. Author

N85-34492# Radiation Monitoring Devices, Inc., Watertown, Mass.
APPLICATIONS OF CDTE TO NUCLEAR MEDICINE Final Report
G. ENTINE 7 May 1985 16 p
(Contract DE-AC02-76EV-02541)
(DE85-011877; DOE/EV-02541/T2) Avail: NTIS HC A02/MF A01

Uses of cadmium telluride (CdTe) nuclear detectors in medicine are briefly described. They include surgical probes and a system for measuring cerebral blood flow in the intensive care unit. Other uses include nuclear dentistry, X-ray exposure control, cardiology, diabetes, and the testing of new pharmaceuticals. DOE

N85-34493# Argonne National Lab., Ill.
ESTIMATING RISKS OF LEAD-INDUCED HEMOGLOBIN DECREMENTS UNDER CONDITIONS OF UNCERTAINTY: METHODOLOGY, PILOT JUDGMENTS AND ILLUSTRATIVE CALCULATIONS
R. G. WHITFIELD and T. S. WALLSTEN Sep. 1984 66 p refs
(Contract W-31-109-ENG-38)
(DE85-012293; ANL/EES-TM-276) Avail: NTIS HC A04/MF A01

Probabilistic judgements about dose-response relationships between lead exposure and subsequent hemoglobin decrements are made. A method for obtaining the judgements, representing them mathematically, and combining them with a measure of lead exposure to estimate health risks is described. A study was performed to test a protocol for obtaining probabilistic judgements from health experts. Judgements of two pilot subjects were encoded to determine the subjects' judgemental dose-response functions for lead-induced hemoglobin decrements. Their judgements were represented mathematically (with the normal-on-log-odds function) and combined with blood-lead data (a measure of exposure to lead) from the National Health and Nutrition Examination Survey II to illustrate the estimation of health risks for US children aged 0 to 3 years. The report also discusses ways to summarize large amounts of complex risk assessment

data and calculations and present them in a form understandable by and useful to decision makers. DOE

N85-34494# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOL. 19, NO. 3, MAY - JUNE 1985
14 Aug. 1985 156 p refs Transl. into ENGLISH of Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 3, May - Jun. 1985 (JPRS-USB-85-005) Avail: NTIS HC A08

Advancements in space biology and aerospace medicine are reported. Topics include: aerospace environments; spacecraft environments, biochemistry, physiological effects, cosmonaut performance, effects of hypokinesia, neurological and sensorimotor effects, musculoskeletal system, data processing in psychology, human behavior, and group dynamics.

N85-34495# Joint Publications Research Service, Arlington, Va.
FLUID-ELECTROLYTE METABOLISM AND RENAL FUNCTION IN COSMONAUTS FOLLOWING 185-DAY SPACEFLIGHT
A. I. GRIGORYEV, B. R. DOROKHOVA, V. Y. SEMENOV, B. V. MORUKOV, E. O. BAYCHOROV, I. S. SKUKINA, and B. V. AFONIN *In its* USSR Rept.: Space Biol. and Aerospace Med. (JPRS-USB-85-005) p 27-34 14 Aug. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biol. i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 3, May - Jun. 1985 p 21-27
Avail: NTIS HC A08

Fluid electrolyte metabolism (FEM) and renal function of the crewmembers of the 185 day spaceflight were examined. Changes in fluid electrolyte metabolism and its regulation were noted. Fluid and sodium retention and higher than preflight sodium excretion in the urine was observed. Postflight a higher excretion of bivalent ions was shown. The higher excretion of calcium was accompanied by a lower concentration of total and ionized calcium in the serum and by a lower concentration of PTH and calcitonin. Variations in potassium metabolism that occurred during flight are assessed including the inability of tissues to retain potassium due to atrophic processes which develop in the weightless state and are due to the unloading of the musculoskeletal system. E.A.K.

N85-34496# Joint Publications Research Service, Arlington, Va.
TOLERANCE TO +GZ AND +GX ACCELERATIONS OF INDIVIDUALS IN OLDER AGE GROUPS IN GOOD HEALTH AND WITH EARLY SIGNS OF ARTERIOSCLEROSIS
A. R. KOTOVSKAYA, D. G. DIMITROV, V. Y. LUKYANYUK, I. F. VIL-VILYAMS, O. L. GOLOVKINA, V. G. ANDREYEVA, N. P. ARTAMONOVA, and M. P. KUZMIN *In its* USSR Rept.: Space Biol. and Aerospace Med. (JPRS-USB-85-005) p 35-41 14 Aug. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biol. i Aviakomicheskaya Meditsina (Moscow), v. 19, no. 3, May - Jun. 1985 p 27-31
Avail: NTIS HC A08

Tolerance to +Gz and +Gx accelerations of healthy and arteriosclerotic subjects, aged 40 to 49, was investigated during 256 centrifugation tests. As compared to the healthy people, the arteriosclerotic subjects showed a lower tolerance: when exposed to 7 +Gz the tolerance threshold decreased from 5.93 + or - 0.57 g to 5.7 + or - 0.44. Visual disorders and loss of consciousness were recorded. When exposed to 5 +Gz and 6 +Gx no subjects displayed visual disorders or loss of consciousness. However, lower tolerance of 5 +Gz due to cardiac arrhythmias was observed in 4.8% arteriosclerotic patients and in none healthy subjects. Lower tolerance to 6 +Gx associated with cardiac arrhythmias was recorded in 23.8% arteriosclerotic versus 11.8% healthy subject. In both healthy and arteriosclerotic subjects acceleration tolerance was good. It is indicated that individual assessment of acceleration tolerance is of great importance for people older than 40 years with health abnormalities. E.A.K.

N85-34497# Joint Publications Research Service, Arlington, Va.
EFFECT OF HYPOKINESIA AND +GZ ACCELERATIONS ON TRANSPORT FUNCTION OF HUMAN BLOOD
N. V. KHAPILOV, V. S. PANCHENKO, N. N. KOTOV, and B. F. ASYAMOLOV *In its* USSR Rept.: Space Biol. and Aerospace Med. (JPRS-USB-85-005) p 42-45 14 Aug. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biol. i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 3, May - Jun. 1985 p 31-33
Avail: NTIS HC A08

The results of 44 studies of circulation parameters and blood transport function of 14 test subjects exposed to 7 day bed rest and acceleration of 4.5 Gz demonstrated that the blood transport carriers and their actively binding centers from working structures in the adaptive reactions. As compared to the pretest level, the distribution ratio of C-14 adenine between two immiscible phases varies from -12 to 14% on bed rest day 3 to +32 to 40% on bed rest day 7; it increases by 145 to 150% after exposure to +4.5 Gz acceleration. The parameters of the blood transport function give a quantitative description of its adaptive reactions to environmental effects. E.A.K.

N85-34498# Joint Publications Research Service, Arlington, Va.
OXYGENATION AND REGIONAL CIRCULATION IN GINGIVAL MUCOSA DURING EXPOSURE TO LOWER BODY NEGATIVE PRESSURE
S. I. VOLVACH, Y. A. KOVALENKO, S. I. PONOMAREV, V. K. GABYSHEV, V. I. NIKIFOROV, A. P. KULEV, and V. V. ARKHIPOV *In its* USSR Rept.: Space Biol. and Aerospace Med. (JPRS-USB-85-005) p 46-50 14 Aug. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biol. i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 3, May - Jun. 1985 p 33-37
Avail: NTIS HC A08

Five subjects were exposed to lower body negative pressure (LBNP). During exposure their regional circulation and oxygen balance of the gingival mucosa were measured and electrocardiography and kinetocardiography were performed to calculate parameters of the left heart function. A distinct correlation between LBNP tolerance and the level of compensatory reactions of the gingival mucosa blood flow and the cardiovascular system as a whole are shown. The subjects with a high LBNP tolerance shows well pronounced regional compensatory reactions of the gingival mucosa that were not accompanied by significant changes in the left heart function. The subjects with a moderate tolerance exhibited either weak or no regional compensatory reactions of the gingival mucosa and significant changes in the left heart function. E.A.K.

N85-34499# Joint Publications Research Service, Arlington, Va.
EFFECT OF WATER IMMERSION OF PARAMETERS OF CENTRAL HEMODYNAMICS IN INDIVIDUALS OVER 45 YEARS OLD
I. O. FOMIN, V. N. ORLOV, A. E. RADZEVICH, and G. S. LESKIN *In its* USSR Rept.: Space Biol. and Aerospace Med. (JPRS-USB-85-005) p 51-56 14 Aug. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biol. i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 3, May - Jun. 1985 p 37-40
Avail: NTIS HC A08

The effect of 7 day dry immersion on central hemodynamics of four test subjects, aged 46, with boundary arterial hypertension was investigated. Central hemodynamics was examined by integrated rheography. Variations in blood pressure, central venous pressure, stroke and cardiac indexes, heart rate and total peripheral resistance were measured. The control subjects showed a decrease of blood pressure during exposure. Two of the test subjects with a short history of boundary arterial hypertension displayed similar variations, whereas two others showed an increase of blood pressure during the immersion period. The test and control subjects did not exhibit significant differences in the stroke and cardiac indexes, heart rate, central venous pressure or total peripheral resistance: stroke and cardiac indexes decreased while central venous pressure and total peripheral resistance increased, and heart rate remained unchanged. E.A.K.

N85-34500# Joint Publications Research Service, Arlington, Va.
LIPID HYDROLYSIS IN MAN DURING ANTIORTHOSTATIC HYPOKINESIA
I. L. MEDKOVA, N. M. NIKOLAYEVA, and O. V. ZHIZNEVSKAYA *In its* USSR Rept.: Space Biol. and Aerospace Med. (JPRS-USB-85-005) p 57-82 14 Aug. 1985 refs Transl. into ENGLISH from Kosmicheskaya I Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 3, May - Jun. 1985 p 40-44
Avail: NTIS HC A08

The activity of pancreatic lipase in the serum and duodenal juice, the activity of monoglyceride lipase in the duodenal juice, the concentration of lipoproteins in the bile, the activity of intestinal enzymes and the concentration of lipid fractions in the feces were measured. These parameters were determined in six test subjects who were exposed to head down tilt for 120 days. It is suggested that bed rest decreases lipolytic enzymes in the duodenal juice and increases pancreatic lipase in the serum. The exposure also leads to a decrease of lipoproteins in the bile, rearrangement of the lipolytic enzymes in the intestine, and to an increase of mono, di and triglycerides in the feces. Changes in the pancreatic function and in lipid hydrolysis and absorption are indicated which are interpreted as compensatory adaptive processes of the digestive organs. E.A.K.

N85-34501# Joint Publications Research Service, Arlington, Va.
DISSOCIATION OF AUTONOMIC AND SENSORY VESTIBULAR REACTIONS
Y. V. KRYLOV, O. A. VOROBYEV, and V. V. ZARITSKIY *In its* USSR Rept.: Space Biol. and Aerospace Med. (JPRS-USB-85-005) p 63-69 14 Aug. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biol. I Aviakosmichheskaya Meditsina (Moscow), v. 19, no. 3, May - Jun. 1985 p 44-48
Avail: NTIS HC A08

The studies of healthy people and test subjects with vestibular reception disorders yielded data about relative independence of the vestibulo-autonomic and vestibulo sensory reactions during routine vestibulometric and tilt tests. The subjects with a changed labyrinthine function showed a higher vestibulo autonomic stability as compared to those with normal hearing. In both groups the sensory component of vestibular reactions did not differ significantly. Hemodynamic changes were found to modify some parameters of the nystagmic reactions. E.A.K.

N85-34502# Joint Publications Research Service, Arlington, Va.
RAT SKELETAL MUSCLES WITH SIMULATION OF PHYSIOLOGICAL EFFECTS OF WEIGHTLESSNESS (MORPHOLOGICAL STUDY)
Y. I. ILINA-KAKUYEVA and V. Y. NOVIKOV *In its* USSR Rept.: Space Biol. and Aerospace Med. (JPRS-USB-85-005) p 81-92 14 Aug. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biol. Aviakosmicheskaya Meditsina (Moscow), v. 19, No. 3, May - Jun. 1985 p 56-60
Avail: NTIS HC A08

Rats were suspended in the head down position for 21 days. The effect of this exposure on skeletal muscles of their fore and hindlimbs were studied by morphological and histochemical method. Changes in the hindlimbs were similar to those seen in real weightlessness of similar duration. The two antigravitational muscles--soleus and gastrochemius muscles--showed greatest changes. The changes in the biceps brachit muscle are assumed to be associated with hemodynamic disorders. It is recognized that the method of rat suspension is adequate for the study of morphological effects of weightlessness on hindlimbs and is inacceptable for that of forelimbs where the exposure induces microcirculation disorders. E.A.K.

N85-34503# Joint Publications Research Service, Arlington, Va.
EFFECT OF ACUTE HYPOXIA ON CORONARY AND SYSTEMIC HEMODYNAMICS
V. S. BEDNENKO, V. N. POLYAKOV, M. V. DVORNIKOV, V. K. STEPANOV, and A. N. KOZLOV *In its* USSR Rept.: Space Biol. and Aerospace Med. (JPRS-USB-85-005) p 93-98 14 Aug. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biol. I Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 3, May - Jun. 1985 p 64-68
Avail: NTIS HC A08

Variations in coronary circulation, cardiac output and heart rate were examined by dopplerography in 14 test subjects kept in an altitude chamber. It is found that during acute hypoxia the effective coronary blood flow decreases distinctly prior to general circulatory disorders. It is recommended to monitor coronary circulation during altitude exposures. E.A.K.

N85-34504# Joint Publications Research Service, Arlington, Va.
EFFECT OF DIBAZOL ON PARAMETERS OF NONSPECIFIC RESISTANCE OF SUBJECTS IN PRESSURIZED CABINS
V. S. NOVIKOV and V. N. BORTNOVSKIY *In its* USSR Rept.: Space Biol. and Aerospace Med. (JPRS-USB-85-005) p 99-102 14 Aug. 1985 refs Transl. into ENGLISH from Kosmicheskaya I Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 3, May - Jun. 1985 p 68-71
Avail: NTIS HC A08

Prophylactic administration of dibazol prevents a decrease of nonspecific resistance and ensures stable variations of adaptation processes in men working in enclosures for a long time. The positive effect of the drug occurs 10 to 15 days after the administration and involves a combined action on phagocytosis, blood homeostasis, and skin antiomicrobial resistance. The interated parameters of nonspecific protection of the test subjects who took dibazol are close or even better than the pretest level. Dibazol also has a beneficial effect on the adaptive process and morbidity rate of the subjects. It is suggested that dibazol affects favorably the nonspecific resistance of the human body and it is recommended as a stimulating and training agent. E.A.K.

N85-34506# Joint Publications Research Service, Arlington, Va.
MONITORING DOSAGE OF VOLATILE COMPOUNDS IN TESTS AT LOW BAROMETRIC PRESSURE
A. V. SEDOV and V. I. AKIMOV *In its* USSR Rept.: Space Biol. and Aerospace Med. (JPRS-USB-85-005) p 108-110 14 Aug. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biol. I Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 3, May - Jun. 1985 p 74-76
Avail: NTIS HC A08

Working airtight spaces, including insulated protective gear exposes man to the combined effect of such specific factors as low barometric pressure and hyperoxic gas atmosphere. These factors, aggravate the toxic effect of chemicals contained in the gas atmosphere of pressurized areas. The presence of volatile compounds in the artificial atmosphere of pressurized areas, the monitoring of which is an important medical and engineering problem in the presence of low barometric pressure and breathing hyperoxic gas mixtures is diecussed. A dynamic gas-mixing unit to control dosage of mixtures of carbon monoxide, methane and dimethylamine with oxygen is the most suitable for this purpose. E.A.K.

N85-34507# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF INDIVIDUAL TOLERANCE IN HYPERBARIC OXYGEN
G. L. ZALTSMAN, G. A. KUCHUK, and A. N. ROVNYY *In its* USSR Rept.: Space Biol. and Aerospace Med. (JPRS-USB-85-005) p 111-113 14 Aug. 1985 refs Transl. into ENGLISH from Kosmiceskaya Biol. I Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 3, May - Jun. 1985 p 76-77
Avail: NTIS HC A08

A hyperbaric gas and water environment, is characterized by the preserice of many extreme factors. Under such conditions, human labor is particularly heavy, dangerous and deleterious.

Screening individuals with tolerance to extreme factors of a hyperbaric environment is of paramount significance to improve the safety and efficiency of underwater work. Among the most important extreme factors of a hyperbaric environment is the effect on man of high partial pressure of oxygen and neutral gases, nitrogen and helium. These factors, limit the depth of submersion and exposure time, whereas for individual with high predisposition they could be threatening even in the range that is accepted for work. Appearance of early manifestations of pathological reactions is used to determine individual tolerance to the above extreme hyperbaric factors. E.A.K.

N85-34508# Joint Publications Research Service, Arlington, Va.
LIPOGENESIS IN RAT LIVER AFTER FLIGHT ABOARD COSMOS-1129 BIOSATELLITE
L. MACHO, R. A. TIGRANYAN, N. SKOTTOVA, and M. PALKOVIC *In its* USSR Rept.: Space Biol. and Aerospace Med. (JPRS-USB-85-005) p 126-128 14 Aug. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biol. i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 3, May - Jun. 1985 p 84-85
Avail: NTIS HC A08

Tests conducted aboard biosatellites revealed that long-term exposure of rats to weightlessness is associated with changes in lipid metabolism. the experiment aboard Cosmos-782 revealed considerable decrease in activity of the main lipogenetic enzymes--malic enzyme and ATP-citrate lyase--in the rat liver immediately after the flight. Activity of these enzymes did not differ from the control 26 days after the flight. A decline in activity of liver malic enzyme and ATP citrate lyase was also demonstrated immediately after the flight in rats flown aboard Cosmos-936 in weightlessness, whereas those exposed to artificial gravity aboard the biosatellite showed no difference from the control in activity of these enzymes. Enzyme activity did not differ from the levels in the vivarium control 25 days after landing. The activity of one of the key lipogenetic enzymes, malic enzyme, in the liver of rats flowing aboard Cosmos-1129 are investigated, and the rate of repair of previously found changes when the recovery period was shortened is determined and the effect of recurrent stress in the recovery period on changes in enzyme activity is examined. E.A.K.

N85-34509# Joint Publications Research Service, Arlington, Va.
PROBLEMS OF AVIATION AND SPACE MEDICINE AND PSYCHOLOGY DISCUSSED AT 14TH GAGARIN LECTURES
In its USSR Rept.: Space Biol. and Aerospace Med. (JPRS-USB-85-005) p 136-144 14 Aug. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biol. i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 3, May - Jun. 1985 p 89-93 Also presented at 14th Gagarin Sci. Lectures Zvezdnyy, USSR, 5-9 Apr. 1984
Avail: NTIS HC A08

Problems of Aviation and Space Medicine and Psychology were discussed. The following problems that are the most pressing are presented: physiological effects of weightlessness, accelerations and altitude; space biology; clinical aerospace medicine; screening and training of flight personnel. E.A.K.

N85-35594*# Arizona Univ., Tucson. Dept. of Biochemistry.
RESPONSES OF SKELETAL MUSCLE TO UNLOADING, A REVIEW
M. E. TISCHLER, S. R. JASPERS, E. J. HENRIKSEN, and S. JACOB 1985 4 p refs Sponsored in part National Inst. of Arthritis, Diabetes and Digestive and Kidney Diseases
(Contract NAGW-227)
(NASA-CR-176177; NAS 1.26:176177) Avail: NTIS HC A02/MF A01 CSCL 06P

Suspension models were used to study muscle response to reduced activity. During 6 days of tail casting, the soleus (SOL) atrophies while the extensor digitorum longus grows relatively normally. After discounting those changes in both muscles due primarily to increased secretion of adrenal hormones, the following conclusions regarding the specific responses of the SOL could be drawn: (1) Atrophy is probably due primarily to increased protein degradation; (2) Decreased synthesis of glutamine may result from reduced availability of ammonia due to diminished use of ATP; (3) Greater muscle glycogen seems to reflect an increased response to insulin of glucose uptake which leads to greater glucose metabolism; and (4) Faster catabolism of branched-chain amino acids can be attributed to enhanced flux through ketoacid dehydrogenase. Studies by others using tail casted suspended rats showed in the SOL: (1) a gradual switch from type 1 to type 2 fibers; (2) increased acid protease activity; and (3) altered muscle function and contractile duration. Using harness suspended rats, others showed in the SOL: (1) significant atrophy; (2) increased numbers of glucocorticoid receptors; and (3) no change in muscle fatigability. Author

N85-35595# European Space Agency, Paris (France).
PROCEEDINGS OF A SCIENTIC MEETING ON THE OCCASION OF THE INAUGURATION OF NEW BUILDINGS FOR THE DFVLR INSTITUTE FOR AEROSPACE MEDICINE
Nov. 1984 142 p refs Transl. into ENGLISH of "Vortraege eines flugmed. Kolloq. aus Anlass der Vortstellung des Naubaues des DFVLR-Inst. Fuer Flugmed." rept. DFVLR-Mitt-83-19 DFVLR, Cologne, 1983 130 p Meeting held at Cologne, 10 Mar. 1982
Original language document was announced as N84-27418 (ESA-TT-857; DFVLR-MITT-83-19) Avail: NTIS HC A07/MF A01; original German version available from DFVLR, Cologne DM 43

Analogies of control mechanisms in flight guidance and medicine; a mathematical model of the human body; models for assessing flight crew workloads; the relationship between personality and performance; cardiovascular responses to weightlessness and orthostatism; cell sensitivity to gravity; radiobiology of space flight; deep diving; and the effect of an unphysiological oxygen supply on the organism were discussed.

N85-35596# European Space Agency, Paris (France).
THE RESEARCH PROGRAMME OF THE INSTITUTE FOR AEROSPACE MEDICINE
K. E. KLEIN *In its* Proc. of a Sci. Meeting on the Occasion of the Inauguration of New Buildings for the DFVLR Inst. for Aerospace Med. (DFVLR-Mitt-83-19) p 6-11 Nov. 1984 Transl. into ENGLISH from "Vortraege eines flugmed. Kolloq. aus Anlass der Vorstellung des Naubaues des DFVLR-Inst. fuer Flugmed." rept. DFVLR-Mitt-83-19 DFVLR, Cologne, 1983 p 9-14 original language document was announced as N84-27419
Avail: NTIS HC A07/MF A01; original German version available from DFVLR, Cologen DM 43

Research into the medical, biological, physiological, and psychological effects of air travel, space flight, and deep sea diving is summarized. Biodynamic effects of helicopter vibration; biorhythm effects of jet travel; pilot performance; and space environment effects on cells and tissues are studied. Author (ESA)

N85-35597# European Space Agency, Paris (France).
ANALOGIES OF CONTROL MECHANISMS IN FLIGHT GUIDANCE AND MEDICINE
F. THOMAS *In its* Proc of a Sci. Meeting on the Occasion of the Inauguration of New Buildings for the DFVLR Inst. for Aerospace Med. (DFVLR-Mitt-83-19) p 12-24 Nov. 1984 Transl. into ENGLISH from "Vortraege eines flugmed. Kolloq. aus Anlass der Vorstellung des Naubaues des DFVLR-Inst. fuer Flugmed." rept. DFVLR-Mitt-83-19 DFVLR, Cologne, 1983 p 15-25 Original language document was announced as N84-27420
Avail: NTIS HC A07/MF A01; original German version available from DFVLR, Cologne DM 43

The similarities between air traffic control and flight control systems and the regulation system of the human body are discussed. It is pointed out that the increasing automation in aeronautics produces a situation where the control loop in the aircraft corresponds to the autonomic nervous system and the hormone system in the human body. It is suggested that doctors could benefit from adapting control loop analysis philosophies

current in engineering, e.g., to detect overload in self regulating mechanisms before they become chronic defects. Author (ESA)

N85-35598# European Space Agency, Paris (France).
A MECHANICAL MODEL OF THE HUMAN BODY AND ITS APPLICATION
H. L. VOGT *In its* Proc. of a Sci. Meeting on the Occasion of the Inauguration of New Buildings for the DFVLR Inst. for Aerospace Med. (DFVLR-Mitt-83-19) p 25-43 Nov. 1984 Transl. into ENGLISH from "Vortraege eines flugmed. Kolloq. aus Anlass der Vorstellung des Naubaues des DFVLR-Inst. fuer Flugmed." rept. DFVLR-Mitt-83-19 DFVLR, Cologne, 1983 p 27-43 Original language document was announced as N84-27421
Avail: NTIS HC A07/MF A01; original German version available from DFVLR, Cologne DM 43

The development, validation and application of a mathematical model of the human body, for vibration and impact tests are described. Nonlinear properties of the body were determined in tests with a shake table mounted on a centrifuge to combine vibration and acceleration forces. The mechanical input impedance which represents the complex resistance of the entire body when seated upright, and transmission of vibration to the head were measured. Impacts were simulated by subjecting a rough model based on the measurements to rectangular, trapezoid and sinusoid pulses. Time courses of acceleration typical of aircraft rescue systems were added. Validation tests were run on a standard laboratory computer. Author (ESA)

N85-35601# European Space Agency, Paris (France).
CARDIOVASCULAR RESPONSES TO ORTHOSTATISM AND WEIGHTLESSNESS
F. BAISCH *In its* Proc. of a Sci. Meeting on the Occasion of the Inauguration of New Buildings for the DFVLR Inst. for Aerospace Med. (DFVLR-Mitt-83-19) p 71-91 Nov. 1984 refs Transl. into ENGLISH from "Vortraege eines flugmed. Kolloq. aus Anlass der Vorstellung des Naubaues des DFVLR-Inst. fuer Flugmed." rept. DFVLR-Mitt-83-19 DFVLR, Cologne, 1983 p 67-85 Original language document was announced as N84-27424
Avail: NTIS HC A07/MF A01; original German version available from DFVLR, Cologne DM 43

Weightlessness simulation studies during astronaut training are discussed. Tilt table and lower body negative pressure box investigations of blood redistribution and orthostatic stress are described. Space flight and zero gravity simulation demonstrate an increase in venous return from the lower limbs. Intrathoracic blood volume and central venous pressure also increase. Blood volume decreases, but urine volume increases. The negative effects of zero gravity adjustment suggest that 6 months in space should not be exceeded. Author (ESA)

N85-35603# European Space Agency, Paris (France).
BIOPHYSICAL RESEARCH IN SPACE
H. BUECKER *In its* Proc. of a Sci. Meeting on the Occasion of the Inauguration of new Buildings for the DFVLR Inst. for Aerospace Med. (DFVLR-Mitt-83-19) p 106-111 Nov. 1984 refs Transl. into ENGLISH from "Vortraege eines flugmed. Kolloq. aus Anlass der Vorstellung des Naubaues des DFVLR-Inst. fuer Flugmed." rept. DFVLR-Mitt-83-19 DFVLR, Cologne 1983 p 99-103 Original language document was announced as N84-27426
Avail: NTIS HC A07/MF A01; original German version available from DFVLR, Cologne DM 43

Radiobiological problems of manned space flight are discussed. Manned space flight studies deal less with quantitative extrapolation of radiobiological observations on Earth than the assessment of novel types of effects for whose actions there is neither adequate theoretical understanding nor an empirical basis. The Apollo-Soyuz Biostack experiments show that significant effects observed in the various biological test organisms resulting from the trajectory of a single heavy ion can be explained to only a small extent by theories based on ground studies. Measured by the absorbed dose, these effects are caused by only a small fraction, (0.5%) of the total radiation doses occurring on the space flights, while the component of 99.5% of weak ionizing radiation leaves no detectable effects. Control experiments carried out in a heavy ion accelerator qualitatively confirm the findings. Author (ESA)

N85-35604# European Space Agency, Paris (France).
THE DEEP DIVING SIMULATOR TITAN: PHYSIOLOGICAL PROBLEMS ASSOCIATED WITH STAYING IN GREAT DEPTHS OF WATER
H. D. FUST *In its* Proc. of a Sci. Meeting on the Occasion of the Inauguration of New Buildings for the DFVLR Inst. for Aerospace Med. (DFVLR-Mitt-83-19) p 112-127 Nov. 1984 refs Transl. into ENGLISH from "Vortraege eines flugmed. Kolloq. aus Anlass der Vorstellung des Naubaues des DFVLR-Inst. fuer Flugmed." rept. DFVLR-Mitt-83-19 DFVLR, Cologne, 1983 p 105-119 Original language document was announced as N84-27427
Avail: NTIS HC A07/MF A01; original German version available from DFVLR, Cologne DM 43

The similarities between the physiological effects of manned space flight and deep diving underwater, and the equipment (e.g., life support) used in both domains are pointed out. Decompression sickness, circulatory changes, disorientation, intoxication by artificial gas mixtures, and lack of external assistance in returning to the Earth's surface are hazards for astronauts and divers. Diving simulator studies (to 600 m depth) of compression, isopression, and decompression effects are outlined. Techniques used to monitor bodily functions are described. Author (ESA)

N85-35605# European Space Agency, Paris (France).
THE EFFECT OF AN UNPHYSIOLOGICAL OXYGEN SUPPLY ON THE ORGANISM
G. SCHAEFER *In its* Proc. of a Sci. Meeting on the Occasion of the Inauguration of New Buildings for the DFVLR Inst. for Aerospace Med. (DFVLR-Mitt-83-19) p 128-139 Nov. 1984 refs Transl. into ENGLISH from "Vortraege eines flugmed. Kolloq. aus Anlass der Vorstellung des Naubaues des DFVLR-Inst. fuer Flugmed." rept. DFVLR-Mitt-83-19 DFVLR, Cologne, 1983 p 121-130 Original language document was announced as N84-27428
Avail: NTIS HC A07/MF A01; original German version available from DFVLR, Cologne DM 43

In order to determine individual time reserves on exposure to oxygen deficiency in a low pressure chamber, the correlation between the partial pressure of O2 in the inhaled air and the pO2 in the arterial and venous blood in humans and animals was studied. Results show that while there is a close relation between the venous and arterial pO2 values and the inspiratory pO2 when a normal atmosphere is breathed, after a short exposure to conditions of reduced atmospheric pressure large differences in the pO2 in the blood occur, while the pO2 in the inhaled air is constant. Under a normal atmosphere, the mean pO2 in the arterial blood is 95 mmHg and the variations are very small. At a nominal altitude of 7,500 m, with an inhaled pO2 of 50 mmHg, the arterial pO2 values vary between 24 and 34 mmHg. The variations in the venous blood are even greater. Results are confirmed in experiments on rabbits. Author (ESA)

N85-35606# School of Aerospace Medicine, Brooks AFB, Tex.
DENTAL MULTI-PURPOSE SLOWSPEED HANDPIECES TEST AND EVALUATION Final Report, Mar. 1984 - Mar. 1985
C. D. FOSTER, K. D. SATROM, P. M. CALLISON, and T. D. STOCKMAN Apr. 1985 37 p
(AD-A155764; USAFSAM-TR-85-23) Avail: NTIS HC A03/MF A01 CSCL 06L

This study included the test and evaluation of three air-driven operative, three electrical operative, two air-driven surgical, and three electrical surgical handpieces. Speed and torque of the handpieces were compared by the use of a hysteresis electric dynamometer. Comparisons were also made of handpiece characteristics. User evaluations were performed in U.S. Air Force dental clinics, and results are presented. The purpose of the study was to provide assistance to the base dental surgeons for selection of dental multi-purpose slowspeed handpieces. GRA

N85-35607# Army Military Personnel Center, Alexandria, Va.
WHOLEBODY RADIATION COUNTING SYSTEM M.S. Thesis - Final Report
G. M. FECHTER 1 May 1985 133 p
(AD-A155842) Avail: NTIS HC A07/MF A01 CSCL 06R

The purpose of this research was to develop a system that would allow the Health Physics staff of the Nuclear Engineering Department of Rensselaer Polytechnic Institute to conduct wholebody radiation counting of all assigned personnel and to determine if a multiple crystal arrangement had any benefits over the single crystal system. The research had three main objectives: (1) to design and construct the electronic hardware necessary to collect data from a series of three NaI(Tl) scintilation crystals; (2) to develop the computer software necessary to interpret this data and calculate concentrations present within those individuals tested. (3) to interface the Helgeson Wholebody Counter with the Vax 11/750 Computer System. This system includes a Texas Instruments TM990-101M Microcomputer which acts as the main control unit for the operator and as the interface with the Vax computer. Additionally, the final system included a computer interface and data acquisition module and it uses a Digital Equipment Corporation VAX 11/750 Computer System for a majority of the data manipulation. This system, was all wholebody counting systems, is characterized by its ability to detect low levels of radionuclide concentration while maintaining adequate resolution to identify the exact isotopes present within the person being counted. GRA

N85-35608# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
THE EFFECT OF +GX ACCELERATION ON PLATELET ACTIVATION AS DETERMINED BY PLASMA PLATELET FACTOR 4 LEVELS Technical Report
F. S. CRAMER, T. J. JENNINGS, C. T. OLSON, G. A. MCDONALD, and L. L. HOWELL Apr. 1985 15 p
(Contract AF PROJ. 7231)
(AD-A155881; AFAMRL-TR-85-038) Avail: NTIS HC A02/MF A01 CSCL 06S

Six healthy men were exposed to a +Gx acceleration (chest to back) profile with peak +Gx levels of 5, 8, and 9 G. Platelet factor 4 levels and platelet counts were measured prior to and immediately following the acceleration exposure. The +Gx acceleration exposure did not affect either parameter, however elevated pre-acceleration platelet factor 4 levels were found in five of six subjects. The possible significance of this is discussed. Future space missions will expose man to unique combinations of environmental stresses. Decompression and +Gx acceleration exposure is one such combination. It is important to determine if there are some features of these stresses which by themselves are benign, but in combination can result in problems for the astronaut. At acceleration levels greater +4 Gx, the subject experiences chest pain. Breathing becomes difficult, causing the subject to become dyspneic and to breathe using his abdominal muscles. Above +6Gx, pulmonary volumes are reduced, and the subject is unable to move his arms and legs. GRA

N85-35609# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
MATCHED FILTERING OF VISUAL EVOKED POTENTIALS TO DETECT ACCELERATION (+GZ) INDUCED BLACKOUT Final Report
J. G. NELSON, L. HREBIEN, and J. P. CAMMAROTA 3 Jan. 1985 29 p
(Contract DA PROJ. WR0-4101)
(AD-A155912; NADC-85040-60) Avail: NTIS HC A03/MF A01 CSCL 06S

In air-combat maneuvering and on human centrifuges, moderate levels of positive acceleration (+ Gz), coupled with moderate rates of onset, produce visual symptoms which are ordinarily progressive: Decreasing visual sensitivity, dimming of the visual field, peripheral light-loss, and central light-loss (black-out). Since these symptoms provide warning of impending loss of consciousness, subjective visual symptoms are the most commonly used tolerance end point in acceleration research. In order to provide an Objective indication of the integrity of the visual system, we have developed (and continue to improve) a method for real-time monitoring of the steady-state visual evoked potential(VEP). Since significant degradation of visual functioning must be recognized in less than approximately four seconds, we required a previously unattained efficiency in producing and measuring the VEP. Using the Fast Fourier Transform (FFT), we developed a method for maximizing the signal-to-noise ratio: A digital, frequency domain, non-white-noise-matched filter, with evaluation only at the expected response peak. The coefficients of the matched filter are determined empirically by analysis of test data obtained in a static run, just prior to the dynamic (+ Gz) run. Experiments on the Navy's Human Centrifuge demonstrated that the response does progressively decrease, disappearing at black-out. Improved computer facilities have permitted evaluation of alternative methods of processing, and the effectiveness of such processing. GRA

N85-35610# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
SIMULATION OF HIGH +GZ ONSET IN THE DYNAMIC ENVIRONMENT SIMULATOR
W. B. ALBERY, T. JENNINGS, M. ROARK, J. FRAZIER, and D. RATINO Apr. 1985 29 p
(Contract AF PROJ. 7231)
(AD-A155963; AD-E301698; AFAMRL-TR-85-030) Avail: NTIS HC A03/MF A01 CSCL 06S

This report documents a unique approach of coupling the cab-axis degree of freedom to the main arm motion of the Air Force Aerospace Medical Research Laboratory human centrifuge, or DES (Dynamic Environment Simulator). This technique of simulating high +Gz/sec to 2.875 Gz/sec was investigated and eleven subjects completed the study. Peripheral light loss (PLL), a precursor to loss of consciousness, was recorded in all eleven subjects using this technique. Three G-tolerance scenarios were investigated; relaxed subject/no anti-G suit inflation, relaxed subject/anti-G suit inflation and straining subject/anti-G suit inflation. A semi-circular light bar was used in the DES cab to monitor peripheral light loss of subjects. The PLL results compare favorably with similar results in the NADC centrifuge where subjects faced tangentially and were subjected to +Gz only rather than +Gx and then +GZ as in this experiment. These results give a strong indication that this technique can be used to stimulate high + Gz onset in the evaluation of anti G-valves, suits and straining maneuvers. GRA

N85-35611# Canyon Research Group, Inc., Westlake Village, Calif.
A REVIEW OF MOTION SICKNESS WITH SPECIAL REFERENCE TO SIMULATOR SICKNESS Final Interim Report, 1 Sep. 1981 - 15 Apr. 1985
R. S. KENNEDY and L. H. FRANK 15 Apr. 1985 51 p
(Contract N61339-81-C-0105)
(AD-A155975; NAVTRAEQUIPC-81-C-0105-16) Avail: NTIS HC A04/MF A01 CSCL 06S

The incidence of simulator sickness is increasing. As many incidents have been reported since 1980 as in all of time before then, and there are implications for training and safety. The present paper reviews: the signs and symptoms, stimuli and response characteristics, anatomical structures, and susceptibility factors. The prevalent theories of the genesis of this malady are put forth and an integrating theory is proposed which suggests that simulator sickness is a form of motion sickness and may be best understood as a special case of sensory rearrangement. Other works in this series describe the scope of the problem, report the incidence in over 4500 exposures, and list more than 2000 relavent references. This correlation theory which is offered suggests that motion sickness is a result of decorrelation between and within sensory input channels of information. This correlation theory is in general agreement with the perceptual conflict or cue mismatch theories, and implies that the central nervous system (CNS) perceives decorrelated stimulations as toxic events. This CNS interpretation

of toxicity causes the constellation of symptoms associated with motion sickness to be released. GRA

N85-35612# Army Research Inst. of Environmental Medicine, Natick, Mass.
WEIGHT LOSS, RECTAL TEMPERATURE AND HEART RATES FOLLOWING THE 1984 BOSTON MARATHON
W. L. DANIELS, B. H. JONES, W. T. MATTHEW, P. I. FITZGERALD, and P. SZLYK May 1985 23 p
(AD-A155984; USARIEM-M29/85) Avail: NTIS HC A02/MF A01 CSCL 06S

This report summarizes the physiological changes that occurred in runners following the 1984 Boston Marathon. The marathon took place under cool and rainy weather conditions (WBGT range 6.5 to 10.5). Subjects for this study consisted of 57 males and 10 females. Their average age was 40.5 years (range 22 to 61 years). Average marathon pace was 219.1 m/min (X time = 3 hrs 12 min 36 sec). During the race, these runners drank an average of 581 mls of fluid. As a result of running a marathon, heart rate increased from 61.3 bts/min to 91.2 bts/minute; body weight decreased from 67.3 kg to 65.7 kg., and rectal temperature (T sub Re)was not significantly changed. Post-heart rate and T sub Re were affected by how soon after finishing the race an individual was measured. Runners who reported to the post-test site soonest tended to be younger and faster than those reporting later. Age and average weekly mileage correlated significantly with mean marathon pace. Our results with heart rate and T sub Re provide medical personnel with some guidance on the effect of the marathon on these parameters in uninjured runners. GRA

N85-35613# Human Engineering Labs., Aberdeen Proving Ground, Md.
THE HUMAN ENGINEERING EYE MOVEMENT MEASUREMENT RESEARCH FACILITY Final Report
J. MAZURCZAK and R. S. PILLALAMARRI Apr. 1985 31 p
(AD-A156099; HEL-TM-6-85) Avail: NTIS HC A03/MF A01 CSCL 06E

Visual perception plays a critical role in many tasks the soldier is asked to perform. One key component of these tasks where visual perception is critical is visual search. An example is the acquisition of key information in monitoring displays and directing fire at targets. How should the individual soldier in any given task allocate his attention to optimize performance and what tasks or operator factor affect visual search performance are some of the questions to be answered. There is a need for developing a body of data on the principles governing human visual search. This knowledge has direct application to such diverse aspects of the Army's mission as the optimal design of visual information displays in various systems, techniques for intelligent interpretation of reconnaissance photographs, and the design of automatic electronic target acquisition devices. Driven by this need a system facility has been developed for monitoring eye movement behavior unobtrusively which imposes no mechanical constraints on the subject. The system utilizes the pupil-center/corneal-reflection measurement technique and features a high speed on-line data processing capability. The purpose of this report is to describe the HEL Eye-Movement Research Facility; including the subject viewing studio, the projection room, and the master control room. GRA

N85-35614# Army Research Inst. of Environmental Medicine, Natick, Mass.
AN ANALYSIS OF AEROBIC CAPACITY IN A LARGE UNITED STATES POPULATION
J. A. VOGEL, J. F. PATTON, R. P. MELLO, and W. L. DANIELS 29 Apr. 1985 34 p
(AD-A156200; USARIEM-M28/85) Avail: NTIS HC A03/MF A01 CSCL 06P

A description of aerobic capacity in a large U.S. population comprised of 1,514 males and 375 females is presented. Such influencing factors as age, training state, occupation and body composition were evaluated. The population consisted of new recruits entering the U.S. Army from civilian life as well as soldiers in a variety of assignments and physical training programs. Age ranged from 17 through 55. Aerobic capacity was determined as maximal oxygen uptake measured directly by the Douglas bag technique during a standard discontinuous treadmill running procedure with the exception of one older aged group. New male and female recruits, representing a young civilian population, entered the service with VO2 max of 51 and 37 ml/kg/BW/min, respectively, and thereafter increased 5-10% during initial basic training. The difference between genders, 30% on an absolute basis, was 14% when expressed as a function of lean body mass. Aerobic capacity was less after occupational training and continued to decrease with age at an average yearly rate of 10%. Aerobic capacity varied with intensity of the occupational physical demand except in groups with significant physical training programs. This first large U.S. population study of aerobic capacity, using a direct treadmill procedure, demonstrates levels consistent with any previously reported population. Author (GRA)

N85-35615# Army Research Inst. of Environmental Medicine, Natick, Mass.
THIRST AND FLUID INTAKE FOLLOWING GRADED HYPOHYDRATION LEVELS IN HUMANS
D. B. ENGELL, O. MALLER, M. N. SAWKA, R. N. FRANCESCONI, and L. DROLET 6 Jun. 1985 38 p
(AD-A156201) Avail: NTIS HC A03/MF A01 CSCL 06S

The relationship among changes in thirst sensations, blood variables, and differential fluid intake in hypohydrated humans was examined. Seven subjects were hypohydrated by 0%, 3%, 5% and 7% of their body weight on four separate trials which were systematically randomized between subjects. Hypohydration levels were achieved with a regimen of restricted food and fluid intake and moderate heat-exercise stress. Statistically significant linear and quadratic trends were found for the intensity of several sensations with progressive hypohydration levels. In general plasma osmolality and renin activity increased and plasma volume decreased with increasing hypohydration levels. During a one hour period of ad-libitum drinking, all subjects consumed insufficient fluid to rehydrate back to baseline body weights. Using regression analyses, fluid intake was predicted by the magnitude of subjective and physiological indices of hypohydration. Results demonstrate that both hypovolemia and plasma osmolality contribute significantly to fluid intake in hypohydrated humans. The results also indicate that thirst sensations are not epiphenomena but make a substantial contribution to differential fluid intake in humans. GRA

N85-35616# Naval Submarine Medical Research Lab., Groton, Conn.
IMMEDIATE VISIBILITY AFTER RED AND WHITE ADAPTATION Interim Report
S. M. LURIA and D. A. KOBUS 26 Apr. 1985 12 p
(Contract NR PROJ. M01-00)
(AD-A156271; AD-F630668; NSMRL-1045) Avail: NTIS HC A02/MF A01 CSCL 06P

The ability to see simulated ship silhouettes and shadows within 10 seconds of looking away from either red or white light of equal brightness was measured. There were no significant differences in the ability to see such targets after adaptation to red or white light at either 0.1 or .01 fL, or when the background illumination was .09 fc or .006 fc. GRA

N85-35617# Massachusetts Univ., Amherst. Dept. of Microbiology.
GENETIC AND PHYSIOLOGICAL CONTROL OF PROTECTIVE ANTIGEN SYNTHESIS BY BACILLUS ANTHRACIS Annual Progress Report, 1 Jan. - 31 Dec. 1984
C. B. THORNE Dec. 1984 51 p
(Contract DAMD17-80-C-0099; DA PROJ. 3M1-61102-BS-12)
(AD-A156324; APR-5) Avail: NTIS HC A04/MF A01 CSCL 06M

The primary objective of the research is to gain information and to develop genetic systems that will contribute to the development of an improved vaccine for anthrax. Genetic and physiological factors controlling the synthesis and accumulation of

protective antigen as well as the two other components of anthrax toxin are being investigated. During the past year attention was focused on: (1) further development and application of a mating system for transfer of plasmids among Bacillus species: and (2) studies of a newly discovered plasmid which encodes capsule formation in B. anthracis. The mating system for transfer of plasmids among B. anthracis, B. cereus, and B. thuringiensis is very useful for assessing the biological significance of plasmids found in the three species. GRA

N85-35618# Oak Ridge National Lab., Tenn.
TRITIUM HAZARD VIA THE INGESTION PATHWAY
C. C. TRAVIS 1985 10 p refs Presented at the 2nd Natl. Topical Meeting on Tritium Technol. in Fission, Fusion and Isotopic Appl., Dayton, Ohio, 30 Apr. 1985
(Contract DE-AC05-84OR-21400)
(DE85-012897; CONF-850405-9) Avail: NTIS HC A02/MF A01

The classic methodology for estimating dose to man from environmental tritium ignores the fact that organically bound tritium in foodstuffs may be directly assimilated in the bound compartment of tissues without previous oxidation. A four-compartment model that allows for the ability to input organically bound tritium in foodstuffs directly into the organic compartments of the model is proposed. It is found that organically bound tritium in foodstuffs can increase the total body dose by a factor of 1.7 to 4.5 times the free body water dose alone, depending on the bound to loose ratio of tritium in the diet. DOE

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BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

A85-47641
DETECTION AND IDENTIFICATION - HOW ARE THEY RELATED?
J. P. THOMAS (California, University, Los Angeles) Optical Society of America, Journal, A: Optics and Image Science (ISSN 0740-3232), vol. 2, Sept. 1985, p. 1457-1467. refs
(Contract NIH-EY-00360)

Detection and identification are described as using the same base of sensory information but applying different decision processes. Consistent with this view, there is no evidence of different sensory cutoffs for the two tasks, and accuracies in the two tasks vary as a function of stimulus strength in closely related fashion. Identification accuracy also depends on the extent to which stimuli are processed independently, and the quantitative relationship between identification and detection can be used to estimate the degree of independence. Author

A85-47642
DETECTION AND IDENTIFICATION OF NEAR-THRESHOLD VISUAL PATTERNS
N. GRAHAM (Columbia University, New York, NY) Optical Society of America, Journal, A: Optics and Image Science (ISSN 0740-3232), vol. 2, Sept. 1985, p. 1468-1482. refs

For a number of visual dimensions - spatial frequency, orientation, spatial position, and direction of motion (at velocities higher than 1 or 2 deg/sec) - experimental results at near-threshold contrasts can be explained by assuming that multiple mechanisms selectively sensitive along that dimension exist and have labeled outputs. For the temporal-position dimension, analogous experimental results can be explained by assuming that each mechanism's output at a particular time depends only on the recent past and is labeled. For the eye-of-origin dimension, however, although the evidence suggests selectively sensitive mechanisms (at least at some spatial and temporal frequencies), these mechanisms seem not to have labeled outputs. For the temporal-frequency dimension (at any fixed spatial frequency), evidence suggests that there are not narrowly tuned mechanisms although there may be very broadly tuned ones. Author

A85-47643
IDEAL DISCRIMINATORS IN SPATIAL VISION - TWO-POINT STIMULI
W. S. GEISLER and K. D. DAVILA (Texas, University, Austin) Optical Society of America, Journal, A: Optics and Image Science (ISSN 0740-3232), vol. 2, Sept. 1985, p. 1483-1497. refs
(Contract NIH-EY-02688)

A series of tests are conducted for the predictions of two models: (1) a general ideal discriminator whose sensitivity is limited only by the initial sequence of mechanisms in the visual system, and (2) a similar model for conditions of stimulus uncertainty. Two-point intensity, discrimination, resolution, and separation discrimination were measured as a function of point-source energy and background luminance. It is found that, at moderate to high intensity levels, the separation threshold is much smaller than the resolution threshold, while at low intensity levels, the resolution threshold is smaller than the separation threshold. Also, the separation threshold increases more rapidly than resolution threshold as a function of intensity. While all three results were predicted by the models, the quantitative fits were not accurate. O.C.

A85-47644
UNCERTAINTY EXPLAINS MANY ASPECTS OF VISUAL CONTRAST DETECTION AND DISCRIMINATION
D. G. PELLI (Syracuse University, NY) Optical Society of America, Journal, A: Optics and Image Science (ISSN 0740-3232), vol. 2, Sept. 1985, p. 1508-1532. Research supported by the Ministry of Defence of England. refs
(Contract NIH-EY-02934; NIH-EY-04432)

An uncertainty model of visual detection is presented which assumes that the observer is uncertain in experiencing many signals, and chooses the most likely. On the basis of only four parameters, the uncertainty model explains why detectability is approximately a power function of contrast ('nonlinear transduction') and is able to accurately predict the effects of summation, facilitation, noise, subjective criterion, and task, for near-threshold contrasts; the uncertainty model thereby constitutes a synthesis of much current understanding of visual contrast detection and discrimination. O.C.

A85-47645
DETECTION AND RECOGNITION OF VISUAL TARGETS
T. BENZSCHAWEL (IBM Thomas J. Watson Research Center, Yorktown Heights, NY) and T. E. COHN (California, University, Berkeley) Optical Society of America, Journal, A: Optics and Image Science (ISSN 0740-3232), vol. 2, Sept. 1985, p. 1543-1550. refs
(Contract NIH-EY-02830; NIH-EY-03176; NIH-EY-01791)

Detection-based interpretations of visual resolution are approached in an evaluation of theorems that relate observer performance in the detection of a single target to that in 1-of-m signal detection, and then predict recognition performance from measured performance at 1-of-m detection. The theorems were evaluated by testing the observers in simple detection, 1-of-m detection, and the recognition of Landolt C targets, comparing predicted and observed performance. The predictions of 1-of-m detection performance on the basis of that for simple detection, and of predictions of recognition from the 1-of-m receiver operating characteristic, were both accurate. O.C.

A85-47646
INTERACTIONS BETWEEN SPATIALLY TUNED MECHANISMS - CONVERGING EVIDENCE
L. A. OLZAK (California, University, Los Angeles) Optical Society of America, Journal, A: Optics and Image Science (ISSN 0740-3232), vol. 2, Sept. 1985, p. 1551-1559. refs
(Contract NIH-EY-00360)

Detection and identification performance is measured for four pairs of sinusoidal gratings that differ in spatial-frequency separation. A modified two-alternative forced-choice procedure (2 x 2) is used to measure performance on both tasks simultaneously. The results provide new evidence for the existence of interactions between tuned mechanisms that respond to widely separated frequencies. A method to compare data obtained in the 2 x 2 method quantitatively with both single- and double-response rating data is developed and used to compare the current data with previous rating results. The magnitudes of interactions isolated by the three procedures agree closely. Author

A85-47647
DOUBLE-JUDGMENT PSYCHOPHYSICS - PROBLEMS AND SOLUTIONS
S. A. KLEIN (Houston, University, TX) Optical Society of America, Journal, A: Optics and Image Science (ISSN 0740-3232), vol. 2, Sept. 1985, p. 1560-1585. refs
(Contract NIH-R01-EY-04776)

Many paradigms for comparing identification thresholds with detection thresholds require the observer to make double judgments. It is shown that these paradigms can produce misleading results because of response biases and attentional shifts. For example, the subject's response bias plus correlated noise can mimic inhibition between channels. Some of these same problems can affect single-judgment paradigms. A detailed analysis of the double-judgment forced-choice paradigm reveals that there is a multiplicity of optimal strategies, some of which enhance identification over detection. Several improved analysis techniques for minimizing the effects of cognitive factors are proposed for both the double-judgment forced-choice paradigm and the double-judgment rating-scale paradigm. A classification scheme for distinguishing different types of interactions and correlations is developed. When the new rating-scale algorithm is applied to the detection of well-separated spatial frequencies, substantial masking but negligible inhibition is found. The rating-scale paradigm is shown to be useful in revealing not only the sensitivity and the interactions of the underlying mechanisms but also the observer's information-processing strategies. Author

A85-47648
EFFECT OF STATIC-NOISE AND GRATING MASKS ON DETECTION AND IDENTIFICATION OF GRATING TARGETS
J. P. THOMAS (California, University, Los Angeles) Optical Society of America, Journal, A: Optics and Image Science (ISSN 0740-3232), vol. 2, Sept. 1985, p. 1586-1592. refs
(Contract NIH-EY-00360)

Ability to detect grating targets and to distinguish between gratings of different spatial frequencies was measured in the presence of static-noise masks and grating masks. Static noise reduces detection and identification in similar fashion, although the effect on detection is greater under some conditions. Grating masks alter identification more than detection, but the effect on identification is reduced when distinctive beat patterns are present to aid identification. Author

A85-47649* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
APPLICATION OF A COMPUTABLE MODEL OF HUMAN SPATIAL VISION TO PHASE DISCRIMINATION
K. R. K. NIELSEN, A. B. WATSON, and A. J. AHUMADA, JR. (NASA, Ames Research Center, Moffett Field, CA) Optical Society of America, Journal, A: Optics and Image Science (ISSN 0740-3232), vol. 2, Sept. 1985, p. 1600-1606. refs
(Contract NCC2-44)

A computable model of human spatial vision is used to make predictions for phase-discrimination experiments. This model is being developed to deal with a broad range of problems in vision and was not specifically formulated to deal with phase discrimination. In the model, cross-correlation of the stimuli with an array of sensors produces feature vectors that are operated on by a position-uncertain ideal observer to simulate detection and discrimination experiments. In this report, the stimuli are compound sinusoidal gratings composed of a fundamental and a higher-frequency component added in various phases. Model predictions are compared with three key results from the literature: (1) the effect of the contrast of the fundamental on phase discrimination, (2) threshold phase difference as a function of the fundamental frequency, and (3) the contrast required for phase discrimination as a function of the frequency ratio of the two grating components. In the first two cases, the predictions capture the main features of the data, although quantitative discrepancies remain. In the third case, the model fails, and this failure suggests additional restrictions on the combination of information across sensors. Author

A85-48075
DEVELOPMENT OF COMPUTER INTERACTIVE TESTS FOR ASSIGNING HELICOPTER PILOTS TO DIFFERENT TRAINING MISSIONS
D. C. MYERS, F. M. SCHEMMER, and E. A. FLEISHMAN (Advanced Research Resources Organization, Silver Spring, MD) Vertiflite (ISSN 0042-4455), vol. 31, Sept.-Oct. 1985, p. 48-50.

Due to the increasingly complex and specialized role played by helicopter pilots, the U.S. Army has undertaken the development of improved procedures for the assignment of student pilots to those missions in which they may be most effective: aeroscout, attack, cargo, or utility. A study has accordingly been conducted employing job analysis methods for the conversion of tasks into ability requirements and test procedures; a battery of 10 tests was then developed for the measurement of one or more of the abilities found to be critical to pilot effectiveness. Memorization, limb coordination, kinesthetic memory, divided attention, reaction time, perceptual speed, flexibility of pattern closure, spatial orientation, and selective attention were tested. O.C.

A85-48086
ADAPTATION TO APPARENT MOTION
S. ANSTIS, D. GIASCHI (York University, Downsview, Canada), and A. I. COGAN (Smith-Kettlewell Institute of Visual Science, San Francisco, CA) Vision Research (ISSN 0042-6989), vol. 25, no. 8, 1985, p. 1051-1062. refs
(Contract NSERC-A-0260; NIH-EY-01558)

A spot alternating between two positions can produce apparent motion (AM). Following prolonged inspection, the AM degenerates into flicker. This adaptation effect was found to depend on spacing and timing; the probability of seeing motion during a 30-sec inspection period declined linearly with log spatial separation (over a range from 0.1 to 1 deg), and with log alternation rate (over a range from 2 to 4.5 Hz). Cross-adaptation, in which subjects were adapted to one alternation rate and tested at another, showed that low alternation rates gave stronger motion signals than high rates did. Adaptation to real motion (RM) strongly suppressed AM, which suggests that AM must be stimulating the same neural pathways as RM. Flickering spots (i.e., in-phase flicker) produced less adaptation than did a spot alternating between two positions (i.e., conterphase flicker), so the adapting mechanisms must be responding to relative temporal phase. Embedding the adapting spots in configurations of other spots, which altered the pattern

of perceived adapting motion without altering the local retinal stimulation, minimized the adaptation, so the adapting mechanism must be responding to the path of seen motion. Adaptation can be used to measure the strength of AM and shows that AM is strongest for small separations, low alternation rates and high luminance contrast. Author

A85-48089
EFFECTS OF SPATIAL SEPARATION AND RETINAL ECCENTRICITY ON TWO-DOT VERNIER ACUITY
J. BECK (Oregon, University, Eugene) and T. HALLORAN (Pittsburgh, University, Johnstown, PA) Vision Research (ISSN 0042-6989), vol. 25, no. 8, 1985, p. 1105-1111. refs
(Contract F49620-83-C-0093)

Experiments investigated how vernier acuity for dot targets is affected by dot spatial separation and retinal eccentricity. Beck and Schwartz (1979) found that the vernier thresholds increased linearly with interdot separation from 7.5 to 30 min arc. Experiment 1 showed that the vernier thresholds increased linearly with interdot separation from 0.5 to 8 deg arc. Experiments 2 and 3 showed that moving the dots into the periphery while keeping the interdot separation constant increased the threshold little if at all. The results are interpreted as supporting the hypothesis that there is (1) an encoding of dot positions in retinal coordinates, and (2) that the relative positions of the dots are made explicit in terms of the slope of the virtual line joining them. The increase in threshold with dot separation indicates that the visual system is unable to directly access and compare the retinal positions of the dots. The constancy of the threshold with eccentricity indicates that the visual system encodes the retinal positions of two well-separated dots as accurately in the periphery as in the fovea. Author

A85-48090
SPATIAL AND TEMPORAL SELECTIVITY OF THE HUMAN MOTION DETECTION SYSTEM
S. J. ANDERSON and D. C. BURR (Western Australia, University, Nedlands) Vision Research (ISSN 0042-6989), vol. 25, no. 8, 1985, p. 1147-1154. refs

Measurements were made of spatial frequency, orientation and temporal frequency selectivity of the visual motion system. The results suggest: (1) There exists in the motion system mechanisms selective for spatial frequency. The preferred spatial frequency varies considerably and extends down to at least 0.06 c/dec. (2) At all spatial frequencies (from 0.1 to 10 C/deg) there exist detectors selective for orientation which vary in (directed) orientation tuning to encompass 360 deg. (3) The bandwidth of both spatial frequency and orientation selectivity vary inversely with spatial frequency: The lower the spatial frequency, the broader the bandwidth. (4) There exist two classes of temporally tuned detectors, one lowpass (sustained) and one bandpass (transient), of preferred temporal frequency of 7-13 Hz (depending on spatial frequency). Author

A85-48753
MEASUREMENT OF LEARNING AND TRANSFER THROUGH CURVE FITTING
W. D. SPEARS (Seville Training Systems Corp., Pensacola, FL) Human Factors (ISSN 0018-7208), vol. 27, June 1985, p. 251-266. refs
(Contract N61339-78-C-0113; N61339-80-D-0009)

It is shown that four empirical constants can be obtained by fitting data to curves and thereby forming an aid in assessing learning and transfer. The constants, the asymptotic performance level (APL), the beginning level (BL), a rate constant (RC) and the curve inflection point (IP) are derived from data smoothed into curves. The fit is evaluated by a least-squares method. APL defines a performance limit or plateau, and can be a transfer measure by projecting a curve of performance data, e.g., a number of errors, to see if it tends towards the APL, starting at the BL and moving with a positive slope, the RC. It is cautioned that the measures may be inadequate for assessing complex tasks or the process of integrating various skills for a single task such as landing on an aircraft carrier. M.S.K.

A85-48754
PART-TASK TRAINING FOR TRACKING AND MANUAL CONTROL
D. C. WIGHTMAN (U.S. Navy, Naval Training Equipment Center, Orlando, FL) and G. LINTERN (Illinois, University, Savoy) Human Factors (ISSN 0018-7208), vol. 27, June 1985, p. 267-283. refs

Part-task training was defined as practice on some set of components of the whole task as a prelude to performance of the whole task. Part-task procedures are intended to improve learning efficiency and to reduce costs. This review focused on the instruction of tracking skills for manual control. Transfer of training was emphasized and crucial features of the methodology and of means of assessing transfer were discussed. The part-task procedures of segmentation, fractionation, and simplification were explained, and procedures for reintegrating parts into the whole task were summarized. Author

A85-48755
TRAINING HIGH-PERFORMANCE SKILLS - FALLACIES AND GUIDELINES
W. SCHNEIDER (Pittsburgh, University, PA) Human Factors (ISSN 0018-7208), vol. 27, June 1985, p. 285-300. refs
(Contract N00014-81-K-0034; NR PROJECT 154-460)

A high-performance skill is defined as one for which (1) more than 100 hours of training are required, (2) substantial numbers of individuals fail to develop proficiency, and (3) the performance of the expert is qualitatively different from that of the novice. Training programs for developing high-performance skills are often based on assumptions that may be appropriate for simple skills. These assumptions can be fallacious when extended to high-performance skills. Six fallacies of training are described. Empirical characteristics of high-performance skill acquisition are reviewed. These include long acquisition periods, heterogeneity of component learning, development of inappropriate strategies, and training of time-sharing skills. A tentative set of working guidelines for the acquisition of high-performance skills is described.
Author

A85-48860
FLIGHT MANAGEMENT SYSTEMS CREATE NEW CREW TRAINING NEEDS
M. K. DEJONGE (Lear Siegler, Inc., Instrument Div., Grand Rapids, MI) ICAO Bulletin, vol. 40, May 1985, p. 29-31.

Flight Management Computer Systems (FMCS) are now part of every newly introduced aircraft. These systems interface with the pilot through a control/display unit, the design of which varies considerably according to the manufacturer of the aircraft or the FMCS, making it necessary to train the pilot for every new or upgraded FMCS. To supplement the training manuals, the existing audio-visual slide-show packages, and the touch-screen systems, a novel hands-on method involving a table-top flight simulator interfaced with the actual FMCS hardware has been introduced. In a set-up developed for Boeing, the FMCS for the B-737-300 is interfaced with an inexpensive Commodore personal computer, which is programmed to provide a simulator of the flight instruments and controls, the autopilot, autothrottle, and the aircraft and engine dynamics, enabling the students to operate the FMCS in a dynamic flight situation, with an aircraft's own navigation data base in the FMCS. I.S.

N85-35599# European Space Agency, Paris (France).
MODELS FOR ASSESSING WORKLOAD OF AIRCREWS ON LONG DISTANCE FLIGHTS
H. M. WEGMANN *In its* Proc. of a Sci. Meeting on the Occasion of the Inauguration of New Buildings for the DFVLR Inst. for Aerospace Med. (DFVLR-Mitt-83-19) p 44-58 Nov. 1984 refs Transl. into ENGLISH from "Vortraege eines flugmed. Kolloq. aus Anlass der Vorstellung des Naubaues des DFVLR-Inst. fuer Flugmed." rept. DFVLR-Mitt-83-19 DFVLR, Cologne, 1983 p 45-56 Original language document was announced as N84-27422
Avail: NTIS HC A07/MF A01; original German version available from DFVLR, Cologne DM 43

The Buley, Gerathewohl, Mohler, and Nicholson flight crew workload assessment models were compared using a flight from Germany to South America. The Mohler model gives the best assessments, but calculations are complex and it underassesses flights which consist only of outward and return flights. A stress index (SI) calculated from flight duty time in hours (T) night flight duty time in hours (N) (night : 01.00-07.00 h local time) coefficient for transits (CTR) coefficient for duration of the stopover (CL) (layover) and coefficient for the number of time zones flown over in the preceding section (CTZ) is proposed : SI = T + N + CTR + (CL.CTZ). Author (ESA)

N85-35600# European Space Agency, Paris (France).
THE RELATIONSHIP BETWEEN PERSONALITY AND PERFORMANCE
K. STEININGER *In its* Proc. of a Sci. Meeting on the Occasion of the Inauguration of New Buildings for the DFVLR Inst. for Aerospace Med. (DFVLR-Mitt-83-19) p 59-70 Nov. 1984 refs Transl. into ENGLISH from "Vortraege eines flugmed. Kolloq. aus Anlass der Vorstellung des Naubaues des DFVLR-Inst. fuer Flugmed." rept. DFVLR-Mitt-83-19 DFVLR, Cologne, 1983 p 57-66 Original language document was announced as N84-27423
Avail: NTIS HC A07/MF A01; original German version available from DFVLR, Cologne DM 43

The difficulties in finding a two dimensional relationship between personality and performance are discussed. The influences of anxiety, motivation, and rigidity of outlook on performance in critical and routine situations are contrasted. The flexible personality, prepared to take risks, performs better in crises, but is less reliable at other times. Author (ESA)

N85-35619# Federal Aviation Agency, Washington, D.C. Office of Aviation Medicine.
PHYSIOLOGICAL RESPONSES TO UNVARYING (STEADY) AND 2-2-1 SHIFTS: MIAMI INTERNATIONAL FLIGHT SERVICE STATION
C. E. MELTON Feb. 1985 33 p
(AD-A155751; FAA-AM-85-2) Avail: NTIS HC A03/MF A01 CSCL 05I

Two types of shift rotation in the same air traffic facility were investigated in order to determine the relative advantages and disadvantages of nonrotating shift work (steady shift) and rotating shift work. The rotating shift work chosen for comparison was a 2-2-1 pattern often preferred by air traffic controllers, and which consists of a schedule of progressively earlier work periods throughout the workweek, with 9 to 14 hours off duty between 8-hour work periods, and an extended off-duty period of 80 hours between workweeks. Objective differences, as judged by urine biochemistry, between workers on the two shift patterns are minimal and insignificant statistically. Generally, however, greater fatigue was reported in connection with the 2-2-1 rotation than with the steady shift, both preshift and postshift. When prework to postwork changes in subjective fatigue were compared for the two shift patterns, no statistically significant differences were noted. Within the 2-2-1 schedule, there was (1) significantly greater excretion of catecholamines on the day watch as compared to the evening watch; and (2) significantly greater preshift fatigue reported on day shift than evening shift. Despite the observed differences between and within the steady and rotating shift patterns, employee participation in shift pattern choice may have contributed greatly to worker contentment and willingness to accept the observed stressors. GRA

N85-35620# Idaho Univ., Moscow. Dept. of Psychology.
MANUAL AND COMPUTER-AIDED SEQUENTIAL DIAGNOSTIC INFERENCE Final Report, May - Aug. 1984
S. E. GORDON Jun. 1985 16 p
(AD-A156229; AFHRL-TP-84-51) Avail: NTIS HC A02/MF A01 CSCL 09B

This paper describes a pilot study on how human subjects process information during a diagnostic inference task. The objective was a descriptive/predictive model of the inference task and how that task could be affected by implementation of an automated system. The study directly supported research being conducted by AFHRL on quantitative techniques to predict the impacts that automation may have on operator performance, by defining its interaction with the operator's information processing (Modelling Impacts of Automation on Non-Automated Tactical Command and Control Systems). The pilot study involved testing human subjects who had to infer the identity of two fictitious diseases by sampling up to eight symptom dimensions. A set of process and performance variables were selected for measurement. Signal detection theory served as the data collection design. Results were in line with anticipated outcomes (i.e., certainty increased as more cues were sampled); however, certainty rate of increase was highest for trials where subjects sampled four cues and lowest for trials where subjects sampled eight cues (total number of cues was eight). The pilot study helped formulate a list of critical variables expected to affect the operator's information processing and define plausible relationships between those processes and automation assistance. Author (GRA)

N85-35621# Air Command and Staff Coll., Maxwell AFB, Ala.
RELAXATION TECHNIQUES
R. MARCONI-DOOLEY Apr. 1985 43 p
(AD-A156248; ACSC-85-1725) Avail: NTIS HC A03/MF A01 CSCL 06P

The project consists of two parts, the written text and the videotape. The text describes how the project idea was formulated, the sources of data used, and how the videotape script was developed. The script describes the concept of relaxation techniques, and the techniques of deep breathing, progressive muscle relaxation, and visualization. Then through a short demonstration, the viewer has the opportunity to experience each of these three techniques. The videotape is used in the Air War College (AWC) noontime film series in conjunction with the AWC Executive Health Assessment and Fitness block of instruction. The videotape can, however, be used to introduce relaxation techniques to any adult. Author (GRA)

N85-35622# Air Command and Staff Coll., Maxwell AFB, Ala.
AIR UNIVERSITY COMMANDER'S AND SUPERVISOR'S GUIDE ON SUBSTANCE ABUSE
H. E. BOOKER Apr. 1985 40 p
(AD-A156336; ACSC-85-0245) Avail: NTIS HC A03/MF A01 CSCL 06E

The use of mood altering substances has become part of our modern way of life. According to a study prepared by the Social Research Group at George Washington University, nearly 80% of adult Americans use some alcohol. The impact this lost work time has on military readiness is my primary motivation for developing this handbook on substance abuse for Air University supervisors and commanders. It is designed to be a ready reference guide to assist in the identification and treatment of substance abuse. Although Air Force Regulation 30-2 (Social Actions Programs) is the primary source, other materials such as books, pamphlets and material from substance abuse guides from other commands and bases are used along with suggestions and recommendations based on my training and eight years of experience as the author, a Social Actions Officer. This guide will give an explanation of Air Force policy on substance abuse, followed by a chapter on your responsibility as a commander and supervisor. There is also

discussion of the substance abuser and the evaluation/rehabilitation process. GRA

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

A85-47182#
ALGAL BIOREGENERATIVE SYSTEMS FOR SPACE LIFE SUPPORT
C. H. WARD (Rice University, Houston, TX) and R. L. MILLER (USAF, School of Aerospace Medicine, San Antonio, TX) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-21 to S-24.

Regenerative life support systems should: (1) recycle water, (2) exchange carbon dioxide and oxygen, (3) produce food, and (4) contain and recover wastes. Eighty-five percent by weight of man's requirements would be satisfied by accomplishing the first two tasks. Algal photosynthetic gas exchange systems have been evaluated for exchange of carbon dioxide and oxygen, and production of biomass. Maximum theoretical overall electrical efficiency, using artificial lights is 4 percent of about 6.3 g dry algae Kw/hr. Attainable efficiencies are about 2 percent. The functional dependence of yield per unit volume on surface-to-volume ratio requires: (1) a large illuminated surface, (2) minimum culture depth, and (3) interrelation of irradiance (power input) with area and volume, and compromise between these parameters for any intended application. Hence a two-man capacity (1200 liters oxygen/day or 1200 g dry algae per day) algal gas exchange system should require from 15-20 sq m illuminated surface and about 32 kW of power. Author

A85-47183*# Martin Marietta Corp., Baltimore, Md.
ALGAL CULTURE STUDIES RELATED TO A CLOSED ECOLOGICAL LIFE SUPPORT SYSTEM
R. RADMER, P. BEHRENS, E. FERNANDEZ, O. OLLINGER, and C. HOWELL (Martin Marietta Laboratories, Baltimore, MD) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-25 to S-28.
(Contract NAS2-10969)

Studies on the steady-state long-term (4 month) culture of Scenedesmus obliquus algae, maintained in an annular air-lift column operated as a turbidostat, were carried out to evaluate the life-supporting possibilities of this system. Chlorophyll production and cell number as functions of the dry weight were linear at constant illumination. Productivity (measured as the product of dry weight, mg/ml, and the growth rate, ml/hr) vs. dry weight rose linearly until the cell density reached a level at which light became limiting (89 percent absorption of the photosynthetically active radiation). In the initial, linear portion of the curve, the productivity was limited by cell growth at the given light intensity. The maximum dilution rate of the system corresponded to the doubling time of 13.4 hr, about half the maximum rate, with a productivity of 80 percent of the maximum theoretical productivity. The high light utilization efficiencies were contributed by the low (10 percent of full sunlight) incident intensities. I.S.

A85-47184#
PHOTOSYNTHETIC PRODUCTIVITY AND VIBRATION/ACCELERATIONAL STRESS CONSIDERATIONS FOR HIGHER PLANTS IN BIOREGENERATIVE SYSTEMS
C. A. MITCHELL, S. L. KNIGHT, and T. PAPPAS (Purdue University, West Lafayette, IN) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-29, S-30.

Conditions for the optimization of photosynthetic productivity of leaf lettuce, and the effects of seismic stress on the productivity of lettuce and soybean were investigated in the framework of the food production program of NASA's Closed Ecology Life-Supporting Systems (CELSS) group. Enrichment with CO2, an increase in the photosynthetically active radiation, and periodic spraying with triacontanol increased crop yield synergistically. On the other hand, mechanical stress (periodic gyratory shaking) reduced photosynthetic productivity in both leaf lettuce and soybean. Experiments in which transpiration and photosynthetic rates were measured in stressed soybean plants for both upper and lower leaf surfaces have demonstrated inhibition of both photosynthesis and transpiration, and an increased resistance to diffusion of water vapor and CO2 on the lower but not the upper leaf surfaces, indicating that transitory stomatal aperture reduction in the lower leaf surfaces is alone responsible for the effects of seismic stress. I.S.

A85-47185#
ACHIEVING MAXIMUM PLANT YIELD IN A WEIGHTLESS, BIOREGENERATIVE SYSTEM FOR A SPACE CRAFT
F. B. SALISBURY (Utah State University of Agriculture and Applied Science, Logan) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 6th, Lausanne, Switzerland, Sept. 18-21, 1984) Physiologist, Supplement (ISSN 0031-9376), vol. 27, Dec. 1984, p. S-31 to S-34. refs

The conditions for achieving maximum wheat yield in space missions are discussed, and the early results reported by NASA's Controlled Environment Life-Support System and the Space Biology Program. The limiting factors are photosynthesis, respiration, and harvest index (edible/total biomass). The presently achieved yield is only 56 percent of the calculated theoretical maximum yield. Among the manipulative factors that can raise photosynthesis most dramatically, by an increase in light absorption, is an early development of closed canopy by plants that can be planted close to each other. Selection and tissue cloning are the suggested approaches, which can also be used to find cultivars with high harvest index. Microgravity is among the foremost problems. The two aspects of it are the biochemical and the physiological responses of plants, and the engineering problems posed by the absence of convection and the need to close all fluid-containing systems. I.S.

A85-47379
HUMAN FACTORS CONSIDERATIONS IN THE ASSESSMENT OF NONDESTRUCTIVE EVALUATION (NDE) RELIABILITY
W. D. RUMMEL (Martin Marietta Aerospace, Denver, CO) IN: Review of progress in quantitative nondestructive evaluation. Volume 3A - Proceedings of the Tenth Annual Review, Santa Cruz, CA, August 7-12, 1983 . New York, Plenum Press, 1984, p. 37-44; Discussion, p. 44-46. refs

Some classical methods for relating human factors to functional performance are considered for their potential application to the characterization of human factors in NDE performance. The training of an NDE operator is reviewed, and the types of human error in NDE operations are summarized. The influence of human factors on the probability of detection (POD) is discussed, and the quantification of signals from known standards is examined as a method of studying problems involving variation from ideal performance. The application of signal detection and decision theory to POD is considered. C.D.

A85-47883
THE ROLE OF ACOUSTICAL CHARACTERISTICS IN THE PERCEPTION OF WARNING SOUNDS AND THE EFFECTS OF WEARING HEARING PROTECTION
P. A. WILKINS and A. M. MARTIN (Southampton, University, England) Journal of Sound and Vibration (ISSN 0022-460X), vol. 100, May 22, 1985, p. 181-190. refs

The relative importance of the acoustical contrasts of a warning sound with other irrelevant sounds and with the ambient noise has been investigated in the context of the perception of warning sounds and the effects of hearing protection being worn by normally hearing subjects. The results indicate that both contrast factors had an influence on the attention demand of the auditory warnings, but that the contrast with the irrelevant sounds was more potent for the specific stimuli investigated. Thus, they emphasize the importance of including a typical recognition requirement when assessing the attention demand of warning sounds. A small additional reduction in the attention demand of both sounds was evident when the subjects were wearing hearing protectors. This effect could occur in the industrial setting, but further research is required to establish its extent and implications. Author

A85-48099
FAST-JET AIRCREW SAFETY
J. FARLEY (British Aerospace, PLC, Dunsfold, England) Flight International (ISSN 0015-3710), vol. 128, Aug. 31, 1985, p. 25-29.

An evaluation is made of tactical combat aircraft crew safety equipment development and performance, with specific reference to RAF experience with Hawk and Harrier fighter crew ejection incidents. The conditions for maximum likelihood of survivability and minimization of injuries are assessed for various aircrew equipment assemblies (encompassing helmets and oxygen masks, life preservers, personal equipment connectors, antigravity suits, emergency intercoms, and seats and harnesses), in light of recorded crew ejection and man/seat separation cases. O.C.

A85-48502* # Purdue Univ., Lafayette, Ind.
OPTIMAL COOPERATIVE CONTROL SYNTHESIS OF ACTIVE DISPLAYS
S. GARG and D. K. SCHMIDT (Purdue University, West Lafayette, IN) Annual Conference on Manual Control, 21st, Columbus, OH, June 1985, Paper. 19 p. refs
(Contract NAG2-228)

The utility of augmenting displays to aid the human operator in controlling high order complex systems is well known. Analytical evaluations of various display designs for a simple k/s-squared plant in a compensatory tracking task using an Optimal Control Model (OCM) of human behavior is carried out. This analysis reveals that significant improvement in performance should be obtained by skillful integration of key information into the display dynamics. The cooperative control synthesis technique previously developed to design pilot-optimal control augmentation is extended to incorporate the simultaneous design of performance enhancing augmented displays. The application of the cooperative control synthesis technique to the design of augmented displays is discussed for the simple k/s-squared plant. This technique is intended to provide a systematic approach to design optimally augmented displays tailored for specific tasks. Author

A85-48584
ON THE IDENTIFICATION AND ANALYSIS OF SACCADIC EYE MOVEMENTS A QUANTITATIVE STUDY OF THE PROCESSING PROCEDURES
P. INCHINGOLO and M. SPANIO (Trieste, Universita, Italy) IEEE Transactions on Biomedical Engineering (ISSN 0018-9294), vol. BME-32, Sept. 1984, p. 683-695. Research supported by the Ministero della Pubblica Istruzione and CNR. refs

A set of quantitative data about signal processing effects on the evaluation of amplitude, duration, and peak-velocity of single saccadic eye movements, as well as on the evaluation of the coefficients of amplitude-peak velocity and amplitude-duration characteristics of a family of saccades, is given. The following aspects of signal processing are theoretically discussed, experimentally supported, and summarized by normative graphs: (1) the analog low-pass filtering applied to the recorded eye movement; (2) its sampling and digitization; (3) the low-pass filtering applied to the digitized signal; (4) the algorithm used to compute the eye velocity; (5) the criteria adopted to determine the beginning and the ending points of the saccades; and (6) the laws used to fit the saccadic characteristics. According to the theoretical and experimental results obtained, some general operating rules and optimal setups for each of the most common experimental situations are proposed, with the aim of standardizing saccade analysis for both researchers and clinicians. Author

A85-48752
HUMAN-SYSTEM PERFORMANCE MEASUREMENT IN TRAINING SIMULATORS
D. VREULS and R. W. OBERMAYER (Vreuls Research Corp., Thousand Oaks, CA) Human Factors (ISSN 0018-7208), vol. 27, June 1985, p. 241-250. refs

Present deficiencies in human performance measurement techniques for training simulators are discussed. Automated performance measurement is controlled by algorithms in real-time, recording performance data wherever feasible. The systems cannot assess hidden knowledge, only overt actions, thereby missing any indication of complex decision-making processes. The practice of measuring whatever is measurable is a default technique employed in the absence of a satisfactory human performance theory. Furthermore, no extensive validation programs have been carried out to prove that the data is a basis for predicting future performance. Finally, there is a lack of quantitative criteria for evaluating performance changes. It is recommended that quantitative operational performance standards be established and that AI systems be developed for measuring performance and providing immediate feedback, using performance data from experts at tasks as reference points. M.S.K.

A85-49458#
THE AUTOMATIC ANALYSIS OF EYE MOVEMENTS AND THE RECORDING OF BRAIN POTENTIALS, EVOKED IN RESPONSE TO ROTATION, WITH THE AID OF A PROCESS COMPUTER FOR THE DIAGNOSTICS OF DISEASES OF THE EQUILIBRIUM SYSTEM [AUTOMATISCHE ANALYSE VON AUGENBEWEGUNGEN UND REGISTRIERUNG ROTATORISCH EVOZIERTER HIRNPOTENTIALE MIT HILFE EINES PROZESSRECHNERS FUER DIE DIAGNOSTIK VON ERKRANKUNGEN DES GLEICHGEWICHTSSYSTEMS]
W. KECK Berlin, Technische Universitaet, Fachbereich Elektrotechnik, Dr.-Ing. Dissertation, 1984, 189 p. In German. refs

The present investigation is concerned with the automatic analysis of nystagmus which can be induced by an excitation of the equilibrium organs. In addition, a description is given of experiments which have been conducted with the objective to measure reactions, occurring in response to rotation, in the human scalp. The investigation has the aim to utilize a process computer for a quantitative nystagmus analysis which is more comprehensive than a manual evaluation. The program NYSLYS provides the basis for a nystagmus real-time analysis which satisfies clinical demands. Very accurate results are obtained by combining phase and extreme-value search and pattern recognition procedures. G.R.

A85-49529
ADAM - A COMPUTER AID TO MAINTAINABILITY DESIGN
H. E. CAHILL and R. C. DAVIDS (Lockheed Missiles and Space Co., Inc., Sunnyvale, CA) IN: Annual Reliability and Maintainability Symposium, San Francisco, CA, January 24-26, 1984, Proceedings . New York, IEEE, 1984, p. 12-16.

This paper describes the applications of a computerized human manikin, ADAM, to equipment drawings from CADAM files to enhance visualization of man-machine interactions. ADAM serves to identify maintenance interfaces and graphically illustrates work positions, reach, size and strength requirements which help the engineer understand the human requirements associated with his

designs. ADAM offers advantages over other computerized human figures in that he is simple to construct and is fully incorporated within the CADAM environment. Several applications are shown to illustrate ADAM's flexibility as a design aid. Author

A85-49975
ANALYSIS OF FUNDAMENTAL HUMAN MOVEMENT PATTERNS THROUGH THE USE OF IN-DEPTH ANTAGONISTIC MUSCLE MODELS
J. M. WINTERS and L. STARK (California, University, Berkeley) IEEE Transactions on Biomedical Engineering (ISSN 0018-9294), vol. BME-32, Oct. 1985, p. 826-839. refs

A basic nonlinear eighth-order agonist-antagonist muscle model, based on engineering studies and design criteria, is presented. The model can simulate the elbow, knee, wrist, and ankle flexion-extension; and the eye, wrist, and head rotation. Systematic protocols, which combine material and geometrical information for each muscle, were developed to obtain the model parameter values for the various muscle constitutive equations. The program can simulate a variety of fundamental movement patterns interactively, and is useful as a teaching-research tool of both theoretical and practical value. I.S.

A85-50053
INTERRELATION BETWEEN ERGONOMICS AND HEALTH PROTECTION FOR SAFETY ASSURANCE IN LONG-LASTING SPACE FLIGHTS [ZASADY WSPOLDZIALANIA ERGONOMIKI Z OCHRONA ZDROWIA W ZABEZPIECZENIU DLUGOTRWALYCH LOTOW KOSMICZNYCH]
T. BOSZKIEWICZ (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland) Postepy Astronautyki (ISSN 0373-5982), vol. 17, no. 3-4, 1984, p. 77-88. In Polish. refs

N85-35623*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
IMPROVED OXYGEN SOURCES FOR BREATHING APPARATUS Final Report, Apr. 1974 - Sep. 1982
P. C. WOOD (San Jose State Univ.) and T. WYDEVEN Aug. 1983 160 p refs
(NASA-TM-86671; NAS 1.15:86671) Avail: NTIS HC A08/MF A01 CSCL 06K

Research is described which is directed toward the preparation of chemical oxygen sources which exhibited improved O2 storage and reaction characteristics when compared to potassium superoxide (KO2). The initial focus of the research was the preparation of calcium superoxide (Ca(O2)2) by the disproportionation of calcium peroxide diperoxyhydrate. the Ca(O2)2 was characterized by chemical, thermal, and x ray analyses. Several methods for scaling up the Ca(O2)2 syntheis process were studied. The reactivity of Ca(O2)2 toward humidified carbon dioxide (CO2) was evaluated and was compared to that of KO2 under flow test conditions approximating those existing in portable breathing apparatus. The reactivities of mixtures of KO2 and Ca(O2)2 or lithium peroxide towards humidified CO2 were also studied. Finally, an analysis of two commercial, KO2-based, self contained self rescuers was conducted to determine the potential weight and volume savings which would be possible if Ca(O2)2 or a mixture of KO2 and Ca(O2)2 were used as a replacement for KO2. Author

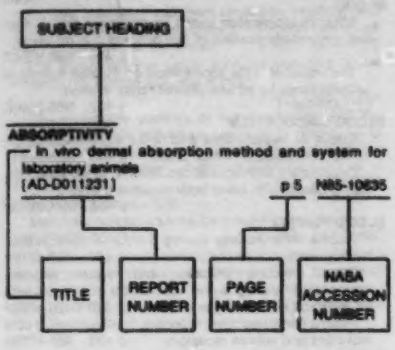
N85-35624# National Resource Analysis Center, Washington, D. C. Committee on Human Factors.
RECOMMENDATIONS FOR CONTENT REVISION AND ALTERNATE DELIVERY MODES FOR THE HUMAN ENGINEERING GUIDE TO EQUIPMENT DESIGN (HEGED)
Mar. 1985 8 p
(Contract N00014-85-G-0093)
(AD-A155781) Avail: NTIS HC A02/MF A01 CSCL 05E

As its meeting on October 4-6, 1983, the Department of Defense Human Factors Engineering Technical Advisory Group (HFE-TAG) recommended that the National Research Council (NRC) consider the need for and an approach to revising the Human Engineering Guide to Equipment Design (HEGED). At the November 1983 meeting of the Committee on Human Factors, the Air Force representative of HFE-TAG requested the committee's advice on whether a revision of the Guide was appropriate and, if so, what its general contents and format should be for the greatest availability to users. The committee does not feel it can undertake or supervise the work of revision. However, it shows willingness to prepare recommendations on the format and content of such a revision, as well as its desire to suggest some possibilities for alternate forms of publication. The purpose of the Guide is to assist designers, engineers, human factors specialists, researchers, system developers, and others in the understanding and application of human factors engineering principles. Since its last publication in 1972, extensive additional useful data and technological innovations have been generated. The committee suggests that the Guide be revised under the guidance of an editorial board. This letter covers suggested areas of coverage and suggests that NRC would make the information available to the general scientific and technical community and should be enabled to receive inputs from this community. In addition, there should be organizations within the military services and other government agencies responsible for maintaining access appropriate to their special needs. GRA

N85-35625# Naval Postgraduate School, Monterey, Calif.
THE USE OF AUSTENITIC STAINLESS STEEL VERSUS MONEL (NI-CU) ALLOY IN PRESSURIZED GASEOUS OXYGEN (GOX) LIFE SUPPORT SYSTEMS M.S. Thesis
B. MARSH Mar. 1985 133 p
(AD-A156305) Avail: NTIS HC A07/MF A01 CSCL 06K

Gaseous oxygen (GOX) must be stored at pressures up to 24 MPa (3500 psi) to provide the flow rates required to support the metabolic needs of a diver. A review of the literature concerned with materials compatibility in pressurized oxygen systems were conducted, with emphasis on metallic structural materials. Review of experimental and theoretical work on combustion of austenitic stainless steels and nickel-copper alloys revealed a consensus that Monel nominal (63 % Ni-34% Cu) is preferred in high pressure oxygen systems, when its strength and weight are acceptable. At the intermediate pressures, 0.7 to 10.3 MPa (100 to 1500 psi), the relative safety of stainless steel as a structural material is unclear. This thesis reviewed the following testing methods: friction rubbing, particle impact, fresh metal exposure to heated flowing GOX, promoted ignition and resonance. An experimental apparatus was used to simulate the conditions of GOX flow found in an operational diving set and to compare the flame propagation rates for austenitic stainless steel (AISI 316), Monel (63% Ni -34% Cu) and carbon steel (AMS 5050) tubing in this environment. GRA

Typical Subject Index Listing



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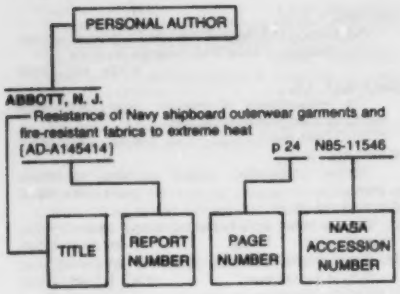

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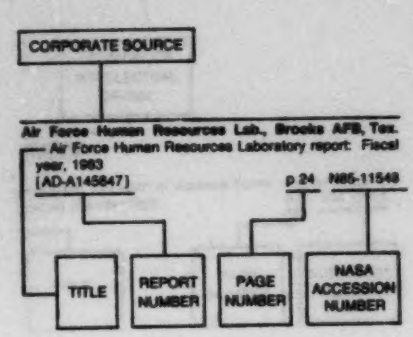

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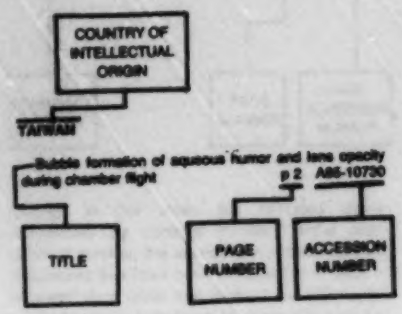

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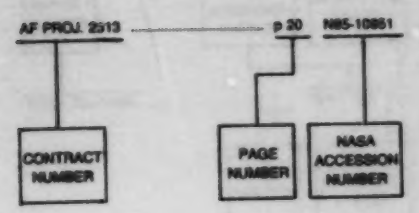

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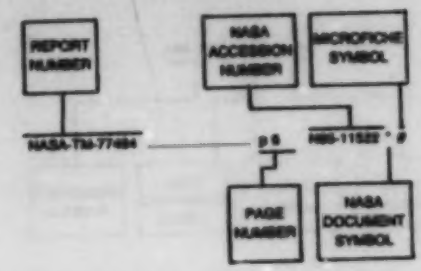

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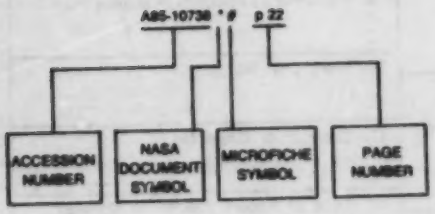

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